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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-25529*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 41, FEBRUARY 1974
Feb. 1974 151 p refs
(NASA-SP-7037(41)) Avail: NTIS HC $5.00 CSCL 01A

This special bibliography lists 514 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1974. Author

N74-25530 West Virginia Univ., Morgantown.
THRUST AUGMENTED WING SECTIONS IN POTENTIAL FLOW Ph.D. Thesis
James Dennis Wilson 1973 159 p
Avail: Univ. Microfilms Order No. 74-11406

A method is presented for calculating the incompressible, potential flow for an arbitrary thrust augmented wing section, possibly experiencing inflow over portions of its surface. The solution includes the shape of an inviscid jet leaving the airfoil calculated by an automatic iteration procedure. The problem is formulated by covering the airfoil-jet surface with line segments which carry velocity discontinuity distributions and satisfy the boundary condition on velocity at the midpoints of the segments. Applying the boundary condition for a particular jet shape loads to a set of linear algebraic equations to be solved for the velocity discontinuity strengths. The final jet geometry is found when the net pressure force for each set of surface elements on the front and back of the jet is balanced by the centrifugal force acting on the fluid within the jet at the corresponding location. Dissert. Abstr.

N74-25531*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISTRIBUTED POROUS THROAT STABILITY BYPASS TO INCREASE THE STABLE AIRFLOW RANGE OF A MACH 2.5 INLET WITH 60 PERCENT INTERNAL CONTRACTION
Robert J. Shaw, Glenn A. Mitchell, and Bobby W. Sanders Washington May 1974 42 p refs
(NASA-TM-X-2974; E-7707) Avail: NTIS HC $3.25 CSCL 20D

The results of an experimental investigation to increase the stable airflow operating range of a supersonic, mixed-compression inlet with 60-percent internal contraction are presented. Various distributed-porous, throat stability-bypass entrance configurations were tested. In terms of diffuser-exit corrected airflow, a large inlet stable airflow range of about 25 percent was obtained with the optimum configuration if a constant pressure was maintained in the by-pass plenum. The location of the centerbody bleed region had a decided effect on the overall inlet performance. Limited unstart angle-of-attack data are presented. Author

N74-25532*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
MODERN CONTROL TECHNIQUES IN ACTIVE FLUTTER SUPPRESSION USING A CONTROL MOMENT GYRO
Philip M. Buchek Mar. 1974 105 p refs
(Grant NGL-05-020-498)
(NASA-CR-138494; SU-DAAR-474) Avail: NTIS HC $8.25 CSCL 01A

Development of organized synthesis techniques, using concepts of modern control theory was studied for the design of active flutter suppression systems for two and three-dimensional lifting surfaces, utilizing a control moment gyro (CMG) to generate the required control torques. Incompressible flow theory is assumed, with the unsteady aerodynamic forces and moments for arbitrary airfoil motion obtained by using the convolution integral based on Wagner's indicial lift function. Linear optimal control theory is applied to find particular optimal sets of gain values which minimize a quadratic performance function. The closed loop system's response to impulsive gust disturbances and the resulting control power requirements are investigated, and the system eigenvalues necessary to minimize the maximum value of control power are determined. Author

N74-25533*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN ANALYTICAL STUDY OF THE EFFECTS OF JETS LOCATED MORE THAN ONE JET DIAMETER ABOVE A WING AT SUBSONIC SPEEDS
Lawrence E. Putnam May 1974 50 p refs
(NASA-TM-X-71965) Avail: NTIS HC $3.25 CSCL 01A

A procedure has been developed to calculate the effects of blowing two jets over a swept tapered wing at low subsonic speeds. The algorithm used is based on a vortex lattice representation of the wing lifting surface and a line sink-source distribution to simulate the effects of the jet exhaust on the wing lift and drag. The method is limited to those cases where the jet exhaust does not intersect or wash the wing. The predictions of this relatively simple procedure are in remarkably good agreement with experimentally measured interference lift and interference induced drag. Author

N74-25534*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOUND RADIATION FROM A HIGH SPEED AXIAL FLOW FAN DUE TO THE INLET TURBULENCE QUADRUPOLE INTERACTION
Marvin E. Goldstein, Burt M. Rosenbaum, and Lynn U. Albers Washington Jun. 1974 49 p refs
(NASA-TN-D-7667; E-7741) Avail: NTIS HC $3.25 CSCL 20A

A formula is obtained for the total acoustic power spectra radiated out the front of the fan as a function of frequency. The formula involves the design parameters of the fan as well as the statistical properties of the incident turbulence. Numerical results are calculated for values of the parameters in the range of interest for quiet fans tested at the Lewis Research Center. As in the dipole analysis, when the turbulence correlation lengths become equal to the interblade spacing, the predicted spectra exhibit peaks around the blade passing frequency and its harmonics. There has recently been considerable conjecture about whether the stretching of turbulent eddies as they enter a stationary fan could result in the inlet turbulence being the dominant source of pure tones from nontranslating fans. The results of the current analysis show that, unless the turbulent eddies become quite elongated, this noise source contributes predominantly to the broadband spectrum. Author

N74-25535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISTRIBUTED EDUCATED THROAT STABILITY BYPASS TO INCREASE THE STABLE AIRFLOW RANGE OF A MACH 2.5 INLET WITH 60-PERCENT INTERNAL CONTRACTION
Robert J. Shaw, Glenn A. Mitchell, and Bobby W. Sanders Washington Jun. 1974 37 p refs
(NASA-TM-X-2975; E-7708) Avail: NTIS HC $3.25 CSCL 01A

The results of an experimental investigation to increase the stable airflow operating range of a supersonic mixed-compression inlet are presented. A distributed educated throat stability-bypass entrance configuration was tested. In terms of diffuser-exit corrected airflow, a large inlet stable airflow range of about 16.1 percent was obtained if a constant pressure was maintained in the bypass plenum. Limited unstart angle of attack data are presented. Author

N74-25536*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WATER TABLE TESTS OF PROPOSED HEAT TRANSFER TUNNELS FOR SMALL TURBINE VANES
Peter L. Meitner Washington Jun. 1974 17 p ref Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TM-X-3073; E-7870) Avail: NTIS HC $3.00 CSCL 01A

Water-table flow tests were conducted for proposed heat-transfer tunnels which were designed to provide uniform flow into their respective test sections of a single core engine turbine vane and a full annular ring of helicopter turbine vanes. Water-table tests were also performed for the single-vane test section of the core engine tunnel. The flow in the heat-transfer tunnels was shown to be acceptable. Author

N74-25537*# Boeing Commercial Airplane Co., Seattle, Wash.
LOW SPEED WIND TUNNEL FLOW FIELD RESULTS FOR JT8D REFAN ENGINES ON THE BOEING 727-200
W. G. Easterbrook and W. H. Roberts Apr. 1974 25 p
(Contract NAS3-17842)
(NASA-CR-134630; D6-43098) Avail: NTIS HC $4.25 CSCL 01A

Low speed flow angularity results are presented showing flow direction at the nacelle locations on the Boeing 727-200. Flow angle probes (yawheads) were used for measurements at side and center inlet positions on the aft fuselage. A range of flap settings were tested with flap angles of 0 deg, 15 deg, and 40 deg selected for investigation. Author

N74-25538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORTRAN PROGRAM FOR CALCULATING VELOCITIES AND STREAMLINES ON THE HUB-SHROUD MID-CHANNEL FLOW SURFACE OF AN AXIAL-OR MIXED-FLOW TURBOMACHINE. 2: PROGRAMMER'S MANUAL
Theodore Katsanis and William D. McNally Washington Apr. 1974 214 p refs
(NASA-TN-D-7344; E-7516) Avail: NTIS HC $5.75 CSCL 01A

A FORTRAN-IV computer program, MERIDL, has been developed that obtains a subsonic or shock-free transonic flow solution on the hub-shroud mid-channel flow surface of a turbomachine. The blade row may be fixed or rotating and may be twisted and leaned. Flow may be axial or mixed, up to 45 deg from axial. Upstream and downstream flow variables can vary from hub to shroud, and provision is made to correct for loss of stagnation pressure. The results include velocities, streamlines, and flow angles on the flow surface and approximate blade surface velocities. Subsonic solutions are obtained by a finite-difference stream-function solution. Transonic solutions are obtained by a velocity-gradient method, using information from a finite-difference stream-function solution at a reduced mass flow. Author

N74-25539*# Scripta Technica, Inc., Washington, D.C.
AEROSPACE VEHICLES AS OBJECTS OF CONTROL
A. S. Shatalov, Yu. I. Topcheyev, and V. S. Kondratyev Washington NASA May 1974 209 p refs Transl. into ENGLISH from "Letatel'nyye Apraraty kak Ob'yekty Upravleniya" Moscow, Mashinostroyeniye Press, 1972 240 p
(Contract NASw-2484)
(NASA-TT-F-809) Avail: NTIS HC $5.75 CSCL 01C

Equations of motion of aerospace vehicles with various arrangements of wings and control surfaces are discussed. The equations devised are complete descriptions of the systems and can therefore be reduced to a system of transfer functions and control diagrams that take account of interactions of the various parts of the vehicle. The dynamic characteristics of the vehicles are presented for standard input disturbances, which are represented in the form of Laplace and z-transforms. A matrix form of description of the vehicle is proposed as a means of taking account of the nonstationary nature of the controlled object. These characteristics make it possible to identify the object on the basis of experimental data. Author

N74-25540*# United Aircraft Corp., East Hartford, Conn. Research Labs.
ANALYSIS OF OSCILLATORY PRESSURE DATA INCLUDING DYNAMIC STALL EFFECTS Final Report
Franklin O. Carta Washington NASA May 1974 102 p refs
(Contract NAS1-11977)
(NASA-CR-2394) Avail: NTIS HC $4.50 CSCL 01A

The dynamic stall phenomenon was examined in detail by analyzing an existing set of unsteady pressure data obtained on an airfoil oscillating in pitch. Most of the data were for sinusoidal oscillations which penetrated the stall region in varying degrees, and here the effort was concentrated on the chordwise propagation of pressure waves associated with the dynamic stall. It was found that this phenomenon could be quantified in terms of a pressure wave velocity which is consistently much less than free-stream velocity, and which varies directly with frequency. It was also found that even when the stall region has been deeply penetrated and a substantial dynamic stall occurs during the downstroke, stall recovery near minimum incidence will occur, followed by a potential flow behavior up to stall inception. Author

N74-25541*# Remtech, Inc., Huntsville, Ala.
BOOSTER AERODYNAMIC HEATING: TEST SUPPORT Final Report
Charles D. Engel, John E. Reardon, and Charles E. Fuller May 1974 61 p refs
(Contract NAS8-28115)
(NASA-CR-120234; RTR-008-4) Avail: NTIS HC $6.25 CSCL 01A

Several technical areas were encompassed in providing support for booster thermal environment test work. These areas included: (1) cavity flow heating, (2) rarefied flow heating, and (3) impulse operated model research and testing. Cavity flow heating problems were studied with respect to the proposed altitude control motors for the space shuttle. Available literature on this subject was reviewed and analytical predictive methods were summarized for use in planning testing work. Rarefied flow heating data was reviewed and correlated. The study showed the importance of considering rarefied flow conditions in launch thermal environment prediction. Impulse operated model research and testing was conducted to provide a basis for understanding and designing such models for booster thermal environment testing. Author

N74-25542# European Space Research Organization, Paris (France).
CALCULATION OF THE EFFECT OF FRICTION ON THE LIFT OF AN AEROFOIL SECTION WITH SLOTTED FLAP
J. Steinheuer Apr. 1974 40 p refs Transl. into ENGLISH of

Berechnung des Reibungseinflusses auf den Auftrieb eines Spaltklappenprofils, DLR-FB-73-04, DFVLR, 1973
(ESRO-TT-43; DLR-FB-73-04) Avail: NTIS HC $5.00; DFVLR, Porz, West Ger. 11 DM

A method for the determination of the lift of a slotted flap airfoil profile by purely computational means is presented. The method is based on existing procedures for the solution of the inviscid potential-flow problem and for the calculation of the boundary layer development. The validity of a new relation between the reduction of lift and the skin friction coefficient was ascertained by comparison with measurements for a single airfoil. The optimal flap position as determined by the calculations agrees very well with experimental results. Further numerical examples show that the method predicts the effect of variation in Reynolds number in the right sense. Author (ESRO)

N74-25543# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PREDICTING LATERNAL HOVER, FLYING QUALITIES WITH PAPER PILOT M.S. Thesis
David L. Nolting Dec. 1973 133 p refs
(AD-775704; GA/MA/73A-2) Avail: NTIS CSCL 01/1

Data were obtained from a fixed base simulation of VTOL aircraft in the lateral hover mode and used to develop a technique for predicting lateral hover flying qualities. The task for the simulation was to maintain position in the presence of lateral gusts. Root-mean-square aircraft state and pilot input data were obtained and correlated with Cooper-Harper Pilot Ratings. A mathematical model for predicting the pilot rating of VTOL aircraft in lateral hover is developed. This model includes: the lateral hover aircraft equations of motion; a stochastic gust model; a linear pilot model; and a pilot rating expression that is a function of rms position error, rms lateral velocity, rms roll rate, and pilot lead terms. (Modified author abstract) GRA

N74-25544# Boeing Vertol Co., Philadelphia, Pa.
INVESTIGATION OF THE EFFECT OF TORSIONAL NATURAL FREQUENCY ON STALL-INDUCED DYNAMIC LOADING Final Technical Report, Jul. 1972 - Jul. 1973
F. J. Tarzanin and Joseph Ranieri Feb. 1974 162 p refs
(Contract DAAJ02-72-C-0093; DA Proj. 1F1-62208-AA-82)
(AD-776415; D210-10678-1; USAAMRDL-TR-73-94) Avail: NTIS CSCL 01/1

For helicopter flight conditions at high blade loadings or airspeeds, the rotor control system experiences a rapid load growth resulting from stall-induced blade torsional moments. These loads frequently grow so large that the aircraft flight envelope is restricted. This report describes an analytical study that determined the effect of changing blade torsional properties on control loads for a wide range of flight conditions. (Modified author abstract) GRA

N74-25573* Air Force Flight Test Center, Edwards AFB, Calif.
A COMPARISON OF TWO METHODS OF EXTRACTING STABILITY DERIVATIVES FROM FLIGHT TEST DATA
Paul W. Kirsten and Lawrence G. Ash *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 43-48 (For availability see N74-25569 15-02)
CSCL 01A

N74-25574* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXTRACTION OF DERIVATIVES FROM FLIGHT DATA FOR SEVERAL AIRCRAFT, USING THE LRC INTERACTIVE COMPUTER SYSTEM
William T. Suit and James L. Williams *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 49-76 ref (For availability see N74-25569 15-02)
CSCL 01A

N74-25575* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
IDENTIFICATION OF AIRCRAFT STABILITY AND CONTROL DERIVATIVES IN THE PRESENCE OF TURBULENCE
Kenneth W. Iliff *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 77-114 refs (For availability see N74-25569 15-02)
CSCL 01A

N74-25577* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATION OF LONGITUDINAL AERODYNAMIC COEFFICIENTS AND COMPARISON WITH WIND-TUNNEL VALUES
Rodney C. Wingrove *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 125-148 refs (For availability see N74-25569 15-02)
CSCL 01A

N74-25580* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NONLINEAR PARAMETER IDENTIFICATION: BALLISTIC RANGE EXPERIENCE APPLICABLE TO FLIGHT TESTING
Gary Chapman and Donn Kirk *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 191-195 refs (For availability see N74-25569 15-02)
CSCL 01A

N74-25583* Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
A SQUARE ROOT FORMULATION FOR THE COMBINED STATE-PARAMETER ESTIMATOR WITH APPLICATION TO THE IDENTIFICATION OF SAILPLANE PERFORMANCE
Michel R. Froidevaux and Charles E. Hutchinson *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 231-242 refs (For availability see N74-25569 15-02)
(Grant AF-AFOSR-2443-73)
CSCL 01A

N74-25584* Systems Control, Inc., Palo Alto, Calif.
A UNIFIED APPROACH TO AIRCRAFT PARAMETER IDENTIFICATION
David E. Stepner and John A. Sorensen *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 243-259 refs (For availability see N74-25569 15-02)
(Contracts NAS1-10700; NAS1-1079; F44620-71-C-0077)
CSCL 01A

N74-25585* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF FLIGHT INSTRUMENTATION ERRORS ON THE ESTIMATION OF AIRCRAFT STABILITY AND CONTROL DERIVATIVES
Wayne H. Bryant and Ward F. Hodge *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 261-280 refs (For availability see N74-25569 15-02)
CSCL 01A

N74-25586* Massachusetts Inst. of Tech., Cambridge. Decision and Control Sciences Group.
PARAMETER IDENTIFIABILITY OF LINEAR DYNAMICAL SYSTEMS
Keith Glover and Jan C. Willems (Groningen Rijksuniversiteit) *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 281-289 refs (For availability see N74-25569 15-02)
(Grant NGL-22-009-124)
CSCL 01A

N74-25587* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A NEW CRITERION FOR MODELING SYSTEMS
Lawrence W. Taylor, Jr. *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 291-313 refs (For availability see N74-25569 15-02)
CSCL 01A

N74-25592* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYSTEMS IDENTIFICATION - REPRISE AND PROJECTIONS
Lawrence W. Taylor, Jr. *In its* Parameter Estimation Tech. and

Appl. in Aircraft Flight Testing Apr. 1974 p 375-379 (For availability see N74-25569 15-02)
CSCL 01A

N74-25593* California Univ., Los Angeles. Dept. of System Science.
SOME AFTER-DINNER REFLECTIONS ON SYSTEM IDENTIFICATION
A. V. Balakrishnan *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 381-385 (For availability see N74-25569 15-02)
CSCL 01A

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-25545+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
AUTOMATIC FLIGHT CONTROL (1966-1973)
4 Feb. 1973 35 p refs
(NAL-Bibl-Ser-51) Avail: NTIS HC $4.75

A bibliography of technical reports on automatic flight control is presented. The literature includes journal articles and conference papers arranged according to year of publication in ascending order. Sources of information are based on NASA technical reports and AIAA aerospace abstracts. Author

N74-25546+ National Aeronautical Lab., Bangalore (India). Documentation Unit.
TITANIUM AND ITS ALLOYS IN AIRCRAFT PRODUCTION (AIRFRAME STRUCTURES): AN ANNOTATED BIBLIOGRAPHY (1967-1971)
31 Dec. 1972 111 p refs
(NAL-Bibl-Ser-37) Avail: NTIS Hc $8.75

A bibliography on the use of titanium in aircraft structures is presented. The subjects discussed are: (1) applications of titanium and its alloys for airframes, (2) fabrication techniques using bonding, forging, forming, machining, and welding, and (3) mechanical and physical properties of titanium alloy systems. Author

N74-25547+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
BIBLIOGRAPHY ON SAFETY IN AIRCRAFT OPERATIONS (1970-1972)
Sep. 1973 57 p refs
(NAL-Bibl-Ser-45) Avail: NTIS HC $5.50

Aspects of aircraft and flight safety are presented in this bibliography. Entries are grouped chronologically under 1970 to 1972. An author index is provided. S.K.W.

N74-25548* LTV Aerospace Corp., Hampton, Va. Technical Center.
A STRUCTURAL DESIGN FOR AN EXTERNALLY BLOWN FLAP (EBF) MEDIUM STOL RESEARCH AIRCRAFT
29 Dec. 1972 134 p
(Contract NAS1-10900)
(NASA-CR-112249) Avail: NTIS HC $9.75 CSCL 01C

A computer program to predict, by reference to structural drawings, the dynamic response of a high lift STOL wing with externally blown flaps was developed. Structural data for the computer program are presented in the form of sketches, weight and dynamic loads information graphs, and tables for an external blown, triple-slotted flap, high lift STOL transport wing. Weight, mass distribution, and moment of inertia data are summarized in table form and presented pictorially by drawing layout. The methods used for obtaining weight data were: (1) actual know, weight of components, (2) preliminary stress sizing, and (3) statistical weight estimating methods. Author

N74-25549*# California Univ., Los Angeles. School of Engineering and Applied Science.
AEROELASTIC STABILITY OF COUPLED FLAP-LAG MOTION OF HINGELESS HELICOPTER BLADES AT ARBITRARY ADVANCE RATIOS
Peretz Friedmann and L. J. Silverthorn Feb. 1974 91 p refs
Sponsored in part by Army Air Mobility R and D Lab., Hampton, Va.
(Grant NGR-05-007-414)
(NASA-CR-132431; UCLA-ENG-7406) Avail: NTIS HC $7.75
CSCL 01B

Equations for large amplitude coupled flap-lag motion of a hingeless elastic helicopter blade in forward flight are derived. Only a torsionally rigid blade excited by quasi-steady aerodynamic loads is considered. The effects of reversed flow together with some new terms due to radial flow are included. Using Galerkin's method the spatial dependence is eliminated and the equations are linearized about a suitable equilibrium position. The resulting system of homogeneous periodic equations is solved using multivariable Floquet-Liapunov theory, and the transition matrix at the end of the period is evaluated by two separate methods. Computational efficiency of the two numerical methods is compared. Results illustrating the effects of forward flight and various important blade parameters on the stability boundaries are presented. Author

N74-25550# Advisory Group for Aerospace Research and Development, Paris (France).
ACTIVE CONTROL SYSTEMS FOR LOAD ALLEVIATION, FLUTTER SUPPRESSION AND RIDE CONTROL
Mar. 1974 77 p refs
(AGARDograph-175; AGARD-AG-175) Avail: NTIS HC $7.00

Papers are presented which were selected to define the present status of industrial applications of active control technology in reducing loads on modern aircraft, and the future potential of active control for aircraft flutter suppression. For individual titles, see N74-25551 through N74-25555.

N74-25551 Lockheed-California Co., Burbank.
EFFECT OF YAW DAMPER ON LATERAL GUST LOADS IN DESIGN OF THE L-1011 TRANSPORT
Frederick M. Hobilt *In* AGARD Active Control Systems for Load Alleviation, Flutter Suppression and Ride Control Mar. 1974 p 1-10 refs (For availability see N74-25550 15-02)

In the design of the L-1011 transport, the reduction lateral gust loads, in continuous turbulence, due to the presence of a yaw damper was reflected in the limit design loads. The resulting load reduction was about 27 percent. In establishing the limit design loads, both the mission analysis and design envelope forms of continuous turbulence gust loads criteria were used. Account was taken, under both forms of criteria, of the fraction of time the damper might be inoperative. The effect of saturation of the damper at the limit-load level was also taken into account. This effect was determined by means of time-history analyses in which the input was a random gust velocity and the rudder angle limits (governed by available hinge moment) were included in the simulation. Author

N74-25552 British Aircraft Corp., Filton (England). Commercial Aircraft Div.
THE EFFECT OF ACTIVE CONTROL SYSTEMS ON STRUCTURAL DESIGN CRITERIA
N. F. Harpur *In* AGARD Active Control Systems for Load Alleviation, Flutter Suppression and Ride Control Mar. 1974 p 11-22 refs (For availability see N74-25550 15-02)

The design criteria for fixed wing aircraft are considered in relation to the active control systems. The reduction of static design loads, engine failure and surge loads, gust loads, and fatigue design loads are discussed along with the improvement of flutter characteristics. F.O.S.

N74-25553* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATUS OF TWO STUDIES ON ACTIVE CONTROL OF AEROELASTIC RESPONSE AT NASA LANGLEY RESEARCH

CENTER
Irving Abel and M. C. Sandford *In* AGARD Active Control Systems for Load Alleviation, Flutter Suppression and Ride Control Mar. 1974 p 23-48 refs (For availability see N74-25550 15-02)
CSCL 01B

The application of active control technology to the suppression of flutter was successfully demonstrated during two recent studies in the Langley transonic dynamics tunnel. The first study involved the implementation of an aerodynamic-energy criterion, using both leading- and trailing-edge controls, to suppress flutter of a simplified delta-wing model. Use of this technique resulted in an increase in the flutter dynamic pressure of approximately 12 percent for this model at a Mach number of 0.9. Analytical methods used to predict the open- and closed-loop behavior of the model are also discussed. The second study, which is a joint effort with the Air Force Flight Dynamics Laboratory, was conducted to establish the effect of active flutter suppression on a model of the Boeing B-52 Configured Vehicle (CCV). Some preliminary results of this study indicate significant improvements in the damping associated with the critical flutter mode. Author

N74-25554 Office National d'Etudes et de Recherches Aeronautiques, Paris (France).
FLUTTER CONTROL BY MODIFICATION OF AN EIGEN VALUE
J. Angelini *In* AGARD Active Control Systems for Load Alleviation, Flutter Suppression and Ride Control Mar. 1974 p 49-56 In FRENCH; ENGLISH summary (For availability see N74-25550 15-02)

A technique for defining an active control system to stabilize a multiple degree of freedom coupling of modes on an aircraft is presented. This technique modifies only the value of the unstable root of the characteristic equation and keeps unchanged the corresponding eigen vector and the other generalized characteristics. Considering this property, it is hoped that this method leads to the least possible interaction with the system. Author

N74-25555 Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
ACTIVE FLUTTER SUPPRESSION ON WINGS WITH EXTERNAL STORES
G. Haidl, A. Lotze, and O. Sensburg *In* AGARD Active Control Systems for Load Alleviation, Flutter Suppression and Ride Control Mar. 1974 p 57-76 refs (For availability see N74-25550 15-02)

A control system is described, which is able to suppress flutter of wing-external store combinations. The aerodynamic flutter suppression forces are generated by movable vanes, attached to the stores, which are moved by a feedback signal from the store motion in such a way, that these forces damp the store motion. By adjusting the phase of the servoloop it is possible to have an active flutter-system below the flutter-speed of the passive system. This arrangement can be used to excite the flutter-mode at subcritical speeds. By switching off the servoloop, damping and frequency can be evaluated. The active flutter suppression system can also be used for reducing the level of externally forced vibration on stores which could occur through excitation by buffet or gusts. Tests results for an elastic wind-tunnel model are given and compared with analytical predictions. Correlation is very good, considering the complexity of the problem. Author

N74-25556*# Michigan Univ., Ann Arbor.
TESTING TECHNIQUES FOR DETERMINING STATIC MECHANICAL PROPERTIES OF PNEUMATIC TIRES
R. N. Dodge, R. B. Larson, S. K. Clark, and G. H. Nybakken Washington NASA Jun. 1974 50 p ref
(Grant NGL-23-005-010)
(NASA-CR-2412; Rept-056080-20-T) Avail: NTIS HC $3.25
CSCL 01C

Fore-aft, lateral, and vertical spring rates of model and full-scale pneumatic tires were evaluated by testing techniques generally employed by industry and various testing groups. The purpose of this experimental program was to investigate what effects the different testing techniques have on the measured values of these important static tire mechanical properties. The testing techniques included both incremental and continuous loadings applied at various rates over half, full, and repeated cycles. Of the three properties evaluated, the fore-aft stiffness was demonstrated to be the most affected by the different testing techniques used to obtain it. Appreciable differences in the fore-aft spring rates occurred using both the increment- and continuous-loading techniques; however, the most significant effect was attributed to variations in the size of the fore-aft force loop. The dependence of lateral stiffness values on testing techniques followed the same trends as that for fore-aft stiffness, except to a lesser degree. Vertical stiffness values were found to be nearly independent of testing procedures if the nonlinear portion of the vertical force-deflection curves is avoided. Author

N74-25557# National Transportation Safety Board, Washington, D.C.
A PRELIMINARY STATISTICAL ANALYSIS OF AIRCRAFT ACCIDENT DATA, US CIVIL AVIATION, 1973
1 May 1974 52 p
(NTSB-APA-74-1) Avail: NTIS HC $5.75

This report presents the record of aircraft accidents which occurred in U.S. Civil Aviation Operations during calendar year 1973. It includes a statistical recapitulation of all accidents and a brief of each air carrier accident, containing the essential items of information. Author

N74-25558# National Transportation Safety Board, Washington, D.C.
ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA, US GENERAL AVIATION, CALENDAR YEAR 1970
18 Apr. 1974 170 p
(NTSB-ARG-74-1) Avail: NTIS HC $11.50

The Annual Review of Aircraft Accident Data is a statistical compilation published by the National Transportation Safety Board. The publication contains statistical information compiled from reports of 4,712 general aviation accidents that occurred during the calendar year 1970. Included in the total number of accidents are 63 collisions between aircraft. By coding each aircraft involved in the collisions, an additional 63 records are produced, bringing the total accidents records to 4,775. This figure reflects the actual number of pilots and aircraft involved in the accidents. Author

N74-25559# National Transportation Safety Board, Washington, D.C.
ANNUAL REVIEWS OF AIRCRAFT ACCIDENT DATA, US AIR CARRIER OPERATIONS, 1970 - 1972
11 Apr. 1974 176 p
(NTSB-ARC-74-1) Avail: NTIS HC $12.00

This publication presents the record of aviation accidents which occurred in all operations of the U. S. Air Carriers for the period 1970-1972. It includes an analysis by classes of carriers, types of accidents, causes and related factors, and accident rates by aircraft make and model. Statistical tables which summarize the accidents, fatalities, and accident rates along with causal tables and the briefs of accidents are presented in the appendices. Author

N74-25560# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: NORTH CENTRAL AIRLINES, INCORPORATED MCDONNELL DOUGLAS DC-9-31, N954N AND DELTA AIR LINES, INCORPORATED CONVAIR CV-880, N8807E O'HARE INTERNATIONAL AIRPORT, CHICAGO, ILLINOIS, 20 DECEMBER 1972
5 Jul. 1973 44 p
(NTSB-AAR-73-15) Avail: NTIS HC $5.25

An aircraft accident involving the collision of two commercial transport aircraft at a runway intersection of O'Hare International Airport is discussed. The fatalities and injuries to the passengers are described. The damage incurred by each aircraft is reported. It was determined that the probable cause of the accident was the failure of the traffic control system to insure separation of the aircraft during a period of restricted visibility. Author

N74-25561*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DISPLAY REQUIREMENTS FOR THE FINAL APPROACH AND LANDING PHASE OF AN RPV MISSION

James C. Howard Apr. 1974 24 p refs
(NASA-TM-X-62346) Avail: NTIS HC $4.25 CSCL 01B

A two part investigation was conducted to determine the display requirements for the final approach and landing phase of a remotely piloted vehicle (RPV) mission, and to assess the relative merits of several possible display configurations. The objective of the first part of the investigation was to obtain subjective assessments of several display configurations, and to select the most promising display concepts for subsequent evaluation in terms of performance measures. A basic display consisting of a perspective image of terrain and runway, a horizon bar and an aircraft symbol was used, and guidance symbology was added to the basic displaying selected state variables. Initial results suggested that as guidance symbology is added to the basic display, pilot acceptance tends to increase. A point of diminishing returns is eventually reached, however, when additional information produces too much clutter, and makes it difficult for the pilot to process the displayed information. Author

N74-25562*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLIGHT INVESTIGATION OF THE VFR AND IFR LANDING APPROACH CHARACTERISTICS AND TERMINAL AREA AIRSPACE REQUIREMENTS FOR A LIGHT STOL AIRPLANE
Harold L. Crane, Kenneth R. Yenni, and Bruce D. Fisher Washington Jun. 1974 40 p refs
(NASA-TM-X-3008; L-9155) Avail: NTIS HC $3.25 CSCL 01B

A flight research program was conducted to determine the terminal area instrument flight capabilities of a light STOL airplane. Simulated (hooded) instrument landing approaches were made using steep single-segment and two-segment glide slopes. A brief investigation was also made of the visual flight terminal area capabilities of the aircraft. The results indicated that the airplane could be flown on a 7 deg glide-slope ILS-type approach in still air with an adequate 3 deg margin for downward correction. Author

N74-25563*# Boeing Vertol Co., Philadelphia, Pa.
CIVIL HELICOPTER NOISE ASSESSMENT STUDY BOEING-VERTOL MODEL 347 Final Report
Ernest G. Hinterkeuser and Harry Sternfeld, Jr. 3 May 1974 99 p refs
(Contract NAS1-12494)
(NASA-CR-132420; D210-10752-2) Avail: NTIS HC $8.00 CSCL 01C

A study was conducted to forecast the noise restrictions which may be imposed on civil transport helicopters in the 1975-1985 time period. Certification and community acceptance criteria were predicted. A 50 passenger tandem rotor helicopter based on the Boeing-Vertol Model 347 was studied to determine the noise reductions required, and the means of achieving them. Some of the important study recommendations are: (1) certification limits should be equivalent to 95 EPNdb at data points located at 500 feet to each side of the touchdown/takeoff point, and 1000 feet from this point directly under the approach and departure flight path, (2) community acceptance should be measured as Equivalent Noise Level (Leq), based on dBA, with separate limits for day and night operations, and (3) in order to comply with the above guidelines, the Model 347 helicopter will require studies and tests leading to several modifications. Author

N74-25564*# Techtran Corp., Glen Burnie, Md.
LONGITUDINAL MOTION OF AN AIRLINER DURING STEEP APPROACH
G. Bruening, J. Lademann, and D. Schafranek Washington NASA Jun. 1974 25 p ref Transl. into ENGLISH from the german report DGLR-Paper-73-023 Presented at the DGLR-DGON Symp. on New Approach and Landing Tech., Duesseldorf, 2-4 May 1973
(Contract NASw-2485)
(NASA-TT-F-15616; DGLR-Paper-73-023) Avail: NTIS HC $4.25 CSCL 01C

The requirement for steeper angles of approach for commercial aircraft were examined to determine the effects on aircraft performance and stability. The subjects discussed are model data, thrust requirements, flight characteristics, phugoid curves, and leveling off. Mathematical models of the factors considered in the study are provided. Data on aircraft performance during various phases of the flight path are shown in graph form. Author

N74-25565*# Techtran Corp., Glen Burnie, Md.
EFFECTS OF NEW APPROACH PROCEDURES ON COCKPIT DESIGN AND CHANCES FOR REALIZATION
Haeuser Washington NASA Jun. 1974 19 p refs Transl. into ENGLISH from the German report DGLR-73-033 Presented at the Symp. on New Approach and Landing Tech., Duesseldorf, 4 May 1973
(Contract NASw-2485)
(NASA-TT-F-15613; DGLR-73-033) Avail: NTIS HC $4.00 CSCL 01C

Design of the cockpit as the working place for the crew and the interface between man and machine for aircraft guidance is a task of great complexity which can be structured and better mastered through the methodology of systems development. After defining the task of cockpit design, necessities are specified and the chances of using these specified values in practice in all phases of development are indicated. Examples of modifications of these specified parameters by new approach procedures are discussed. Author

N74-25566*# Kanner (Leo) Associates, Redwood City, Calif.
FLIGHT-MECHANICS PROBLEMS DURING LANDING APPROACH WITH DIRECT LIFT CONTROL, EXEMPLIFIED BY HFB 320 HANSA
D. Hanke and H. H. Lange Washington NASA Jun. 1974 34 p refs Transl. into ENGLISH from the German report DGLR-73-024 Presented at the Symp. on New Approach and Landing Tech., Duesseldorf, 2-4 May 1973
(Contract NASw-2481)
(NASA-TT-F-15614; DGLR-73-024) Avail: NTIS HC $4.75 CSCL 01C

The problems relating to path control which are encountered during landing approach with jumbo and STOL aircraft are outlined, and special consideration is given to those which occur during steep approaches used for noise abatement. The direct control of lift represents one possibility for alleviating these problems. The capabilities and limits of a DLC system such as was used in an HFB 320 Hansa are evaluated on the basis of simulation and flight test results. The preliminary empirical data from steep two-segment noise-abatement flights with the HFB 320 are reported. Author

N74-25567*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
COMMUNITY ACCEPTANCE OF HELICOPTER NOISE: CRITERIA AND APPLICATION
Charles L. Munch and Robert J. King [1974] 87 p refs
(Contract NAS1-12495)
(NASA-CR-132430) Avail: NTIS HC $7.50 CSCL 01C

A study was conducted to define those criteria necessary for civil helicopter operations to be acoustically acceptable to the communities from which they operate and over which they fly. The study involved surveying existing domestic and foreign Federal regulations and guidelines, state and local noise ordinances, results of community noise annoyance studies, and results of individual aircraft noise annoyance studies, and results of individual aircraft noise annoyance studies in order to establish the criteria. The final criteria selection are based on the Day-Night Level, L sub DN, a measure of total noise exposure. The basic rating unit is the A weighted sound pressure level (dbA) which has accuracy comparable to other units currently used for aircraft. An L sub DN of 60 is recommended as a criterion for areas where the ambient noise is below 58 dbA. An L sub DN value 2 dbA above the local ambient is recommended for areas where the ambient is above 58 dbA. Author

N74-25568*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GEOMETRY CONSIDERATIONS FOR JET NOISE SHIELDING WITH CTOL ENGINE-OVER-THE-WING CONCEPT
U. VonGlahn, D. Groesbeck, and M. Reshotko Jun. 1974 40 p refs Presented at 7th Fluid and Plasma Dyn. Conf., Palo Alto,

Calif., 17-19 Jun. 1974; sponsored by AIAA
(NASA-TM-X-71562; E-7991) Avail: NTIS HC $3.25 CSCL 01C

Jet noise shielding benefits for CTOL engine-over-the-wing installations were obtained with various model-scale circular nozzles and wing chord geometries. Chord-to-nozzle diameter ratios were varied from 3 to 20, while ratios of nozzle height above the wing to the diameter were varied from near zero to 3. Spectral noise data were obtained with jet velocities from 640 to 1110 ft/sec. Characteristics of low frequency noise sources are discussed. Jet-noise shielding is correlated in terms of acoustic and geometric parameters. Implications of extending the model-scale data to full-scale are discussed. Author

N74-25569*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
PARAMETER ESTIMATION TECHNIQUES AND APPLICATION IN AIRCRAFT FLIGHT TESTING
Washington Apr. 1974 390 p refs Symp. held at Edwards, Calif., 24-25 Apr. 1973
(NASA-TN-D-7647; H-806) Avail: NTIS HC $8.25 CSCL 01C

Technical papers presented at the symposium by selected representatives from industry, universities, and various Air Force, Navy, and NASA installations are given. The topics covered include the newest developments in identification techniques, the most recent flight-test experience, and the projected potential for the near future. For individual titles, see N74-25570 through N74-25593.

N74-25570* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
AN OVERVIEW OF PARAMETER ESTIMATION TECHNIQUES AND APPLICATIONS IN AIRCRAFT FLIGHT TESTING
Herman A. Rediess *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 1-18 refs (For availability see N74-25569 15-02)
CSCL 01C

Parameter estimation is discussed as it applies to aircraft flight testing, and an overview of the symposium is presented. The evolution of techniques used in flight testing is reviewed briefly, and it is pointed out how the changing character of the aircraft tested and the availability of advanced data systems have promoted this evolution. Recent advances in optimal estimation theory have stimulated widespread interest and activity in parameter estimation. The framework of these advanced techniques is outlined to set the stage for subsequent papers. The session topics are introduced and related to the requirements of flight-test research. Author

N74-25571* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A SURVEY OF AFFDL PARAMETER ESTIMATION EFFORTS AND FUTURE PLANS
D. C. Eckholdt and W. R. Wells (Cincinnati Univ.) *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 19-38 refs (For availability see N74-25569 15-02)
CSCL 01C

An overview is presented of the applications of parameter estimation methods to the following areas of interest at the Air Force Flight Dynamics Laboratory (AFFDL): (1) conventional stability and control parameter estimation of rigid aircraft; (2) extension to elastic aircraft; (3) extension to stall/spin aerodynamics of rigid aircraft with a nonlinear model; (4) application to the pilot model identification; and (5) correlation of wind tunnel, drop model and flight test data. Only well-documented algorithms are used with modification to the model as required for the specific application. The genesis of each problem and other background information are discussed which enumerate the algorithms and explain how this information is used to improve existing operational aircraft characteristics as well as specify design criteria for future USAF aerospace vehicles. Author

N74-25572* Naval Air Test Center, Patuxent River, Md.
NAVY PARTICIPATION IN THE DEVELOPMENT OF AIRFRAME PARAMETER IDENTIFICATION TECHNIQUES
Roger A. Burton and Arthur J. Schuetz (Naval Air Development Center) *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 39-42 (For availability see N74-25569 15-02)
CSCL 01C

The Navy is currently involved in the development of advanced parameter identification techniques for use in aircraft flight testing and refinement of aircraft dynamic systems modeling. An overview is presented of the Navy's research programs, capabilities, and facilities. The use of parameter identification techniques are related to the flight testing, development, and simulation of aircraft and aircraft systems in the areas of flying qualities, automatic flight controls, flight dynamics, and advanced landing systems. Preliminary analytical and flight test results are presented. The impact that new parameter identification technology has on Navy flight test philosophy is discussed. Future plans are outlined. Author

N74-25573* Air Force Flight Test Center, Edwards AFB, Calif.
A COMPARISON OF TWO METHODS OF EXTRACTING STABILITY DERIVATIVES FROM FLIGHT TEST DATA c01
Paul W. Kirsten and Lawrence G. Ash *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 43-48 (For availability see N74-25569 15-02)
CSCL 01A

Two methods for extracting stability derivatives from flight data are compared. A modified Newton-Raphson quasilinearization minimization technique and a digital-analog (hybrid) matching technique were used to analyze the same data maneuvers obtained from two aircraft. About 70 maneuvers from an F-111E aircraft were analyzed over a Mach number range of 0.3 to 2.0 and an angle of attack range of 3 to 19 degrees. About 20 maneuvers were analyzed for the X-24A lifting body at Mach numbers of 0.5, 0.8, and 0.9, and an angle of attack range of 4 to 13 degrees. Stability derivatives were extracted from these maneuvers and the results from the two techniques, along with wind tunnel results, were compared. Author

N74-25574* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXTRACTION OF DERIVATIVES FROM FLIGHT DATA FOR SEVERAL AIRCRAFT, USING THE LRC INTERACTIVE COMPUTER SYSTEM c01
William T. Suit and James L. Williams *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 49-76 ref (For availability see N74-25569 15-02)
CSCL 01A

Results are presented of a procedure for estimating stability and control parameters from flight data, by using maximum likelihood methods employing an interactive computer system, which was established at the NASA Langley Research Center. Problems encountered are discussed. Author

N74-25575* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
IDENTIFICATION OF AIRCRAFT STABILITY AND CONTROL DERIVATIVES IN THE PRESENCE OF TURBULENCE c01
Kenneth W. Iliff *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 77-114 refs (For availability see N74-25569 15-02)
CSCL 01A

A maximum likelihood estimator for a linear system with state and observation noise is developed to determine stability and control derivatives from flight data obtained in the presence of turbulence. The formulation for the longitudinal short-period mode is presented briefly, including a special case that greatly simplifies the problem if the measurement noise on one signal is negligible. The effectiveness and accuracy of the technique are assessed by applying it first to simulated flight data, in which the true parameter values and state noise are known, then to actual flight data obtained in turbulence. The results are compared with data obtained in smooth air and with wind-tunnel data. The complete maximum likelihood estimator, which accounts for both state and observation noise, is shown to give the most accurate estimate of the stability and control derivatives from flight data obtained in turbulence. It is superior to the techniques that ignores state noise and to the simplified method that neglects the measurement noise on the angle-of-attack signal. Author

N74-25576* Systems Control, Inc., Palo Alto, Calif.
IDENTIFICATION OF M2/F3 STABILITY AND CONTROL DERIVATIVES FROM FLIGHT DATA CONTAINING GUST EFFECTS
David E. Stepner and Raman K. Mehra *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 115-124 refs (For availability see N74-25569 15-02)
CSCL 01C

The application of the maximum likelihood identification technique to M2/F3 lifting body flight data containing wind gust effects is discussed. With the objective of this effort being the identification of the stability and control derivatives, it is shown first that the output error technique (or modified Newton-Raphson) fails to fit the recorded data accurately. The means of applying the maximum likelihood technique to this problem are then discussed and the results given which indicate an accurate fit to the data. The question of derivative signs opposite to the wind tunnel values is then addressed and the results of three techniques for dealing with this problem are presented. These techniques are a priori weighting, fixing parameter values, and rank deficient inverses. Author

N74-25577* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ESTIMATION OF LONGITUDINAL AERODYNAMIC COEFFICIENTS AND COMPARISON WITH WIND-TUNNEL VALUES c01
Rodney C. Wingrove *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 125-148 refs (For availability see N74-25569 15-02)
CSCL 01A

Some recent experience at Ames Research Center in the estimation of aerodynamic coefficients for the Lear-Jet and the Augmentor Wing Jet STOL Research Aircraft is reviewed. The coefficients estimated from flight data are compared with values based on large-scale wind-tunnel tests. The results obtained by the regression and quasilinearization identification techniques are also compared. The regression method generally provides the lower standard deviation in the coefficient estimates and provides the better fit to the wind-tunnel values. The addition of nonlinear terms in the aerodynamic equations decreases the difference between the estimated and measured time histories but also increases the standard deviation in the estimated coefficient values. Author

N74-25578* Calspan Corp., Buffalo, N.Y.
APPLICATION OF A KALMAN FILTER IDENTIFICATION TECHNIQUE TO FLIGHT DATA FROM THE X-22A VARIABLE STABILITY V/STOL AIRCRAFT
J. Victor Lebacqz *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 149-174 refs Sponsored in part by NASA and FAA (For availability see N74-25569 15-02)
(Contracts N00019-69-C-0534; N00019-71-C-0044; N00019-72-C-0417)
CSCL 01C

A digital identification technique based on Kalman filter theory was developed for the estimation of V/STOL aircraft stability and control parameters from flight data. The application of this technique to flight data from flying qualities experiments using the variable stability X-22A V/STOL aircraft is discussed. The estimation algorithm is briefly reviewed, experimental and data acquisition procedures used in the X-22A flight programs are outlined, and specific problem areas such as the determination of noise statistics and selection of pilot inputs to enhance identifiability are discussed. Results are presented for a wide range of simulated dynamic configurations. Author

N74-25579* United Aircraft Corp., East Hartford, Conn. Sikorsky Aircraft Div.
HELICOPTER DERIVATIVE IDENTIFICATION FROM ANALYTIC MODELS AND FLIGHT TEST DATA
John Molusis and Stan Briczinski *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 175-186 refs (For availability see N74-25569 15-02)
CSCL 01C

Recent results of stability derivative identification from helicopter analytic models and flight test data are presented. Six and nine degree-of-freedom (DOF) linear models are identified from an analytic nonlinear helicopter simulation using a least square technique. The identified models are compared with the convectional partial differentiation method for obtaining derivatives to form the basis for interpretation of derivatives identified from flight data. Six degree-of-freedom models are identified from CH-53A and CH-54B flight data, using an extended Kalman filter modified to process several maneuvers simultaneously. The a priori derivative estimate is obtained by optimal filtering of the data and then using a least square method. The results demonstrate that a six DOF identified model is sufficient to determine the low frequency modes of motion, but a nine DOF rotor/body model is necessary for proper representation of short-term response. Author

N74-25580* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NONLINEAR PARAMETER IDENTIFICATION: BALLISTIC RANGE EXPERIENCE APPLICABLE TO FLIGHT TESTING c01
Gary Chapman and Donn Kirk *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 191-195 refs (For availability see N74-25569 15-02)
CSCL 01A

The parameter identification scheme being used is a differential correction least squares procedure (Gauss-Newton method). The position, orientation, and derivatives of these quantities with respect to the parameters of interest (i.e., sensitivity coefficients) are determined by digital integration of the equations of motion and the parametric differential equations. The application of this technique to three vastly different sets of data is used to illustrate the versatility of the method and to indicate some of the problems that still remain. Author

N74-25581* Southern Methodist Univ., Dallas, Tex. Information and Control Sciences Center.
IDENTIFICATION OF AIRCRAFT STABILITY AND CONTROL PARAMETERS USING MULTILEVEL, HIERARCHICAL ESTIMATION
C. M. Fry and A. P. Sage *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 199-222 refs (For availability see N74-25569 15-02)
(Grant NSF GK-33348)
CSCL 01C

Previous attempts to identify aircraft stability and control derivatives from flight test data, using three-degrees-of-freedom (3-DOF) longitudinal or lateral-directional perturbation-equations-of-motion models, suffer from the disadvantage that the coupling between the longitudinal and lateral-directional dynamics has been ignored. In this paper the identification of aircraft stability parameters is accomplished using a more accurate 6-DOF model which includes this coupling. Hierarchical system identification theory is used to reduce the computational effort involved. The 6-DOF system of equations is decomposed into two 3-DOF subsystems, one for the longitudinal dynamics and the other for the lateral-directional dynamics. The two subsystem parameter identification processes are then coordinated in such a way that the overall system parameter identification problem is solved. Author

N74-25582* Northeastern Univ., Boston, Mass. Dept. of Electrical Engineering.
PARAMETER ESTIMATION USING AN A POSTERIORI CRITERION
Ralph E. Bach, Jr. *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 223-230 refs (For availability see N74-25569 15-02)
(Contract NAS2-7397)
CSCL 01C

A procedure for estimating noise statistics as well as system model parameters, based on a maximum likelihood criterion, has been successfully applied to a number of aircraft parameter-identification problems. In the present investigation, an a posteriori criterion is examined for use in such an application, when it is desired to model process noise. The criteria lead to identical results when there is no process noise. Author

N74-25583* Massachusetts Univ., Amherst. Dept. of Electrical and Computer Engineering.
A SQUARE ROOT FORMULATION FOR THE COMBINED STATE-PARAMETER ESTIMATOR WITH APPLICATION TO THE IDENTIFICATION OF SAILPLANE PERFORMANCE c01
Michel R. Froidevaux and Charles E. Hutchinson *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 231-242 refs (For availability see N74-25569 15-02)
(Grant AF-AFOSR-2443-73)
CSCL 01A

A square root formulation is presented for the discrete combined state parameter estimation problem with linear plant dynamics, Gaussian random disturbances, and constant but uncertain parameters. The estimator is a combination of the classical Kalman filter and a maximum likelihood algorithm which maximizes the parameter log-likelihood function using a first order search routine. Author

N74-25584* Systems Control, Inc., Palo Alto, Calif.
A UNIFIED APPROACH TO AIRCRAFT PARAMETER IDENTIFICATION c01
David E. Stepner and John A. Sorensen *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 243-259 refs (For availability see N74-25569 15-02)
(Contracts NAS1-10700; NAS1-1079; F44620-71-C-0077)
CSCL 01A

The most accurate identification results are obtained when all three elements of the identification process - the identification algorithm, the control input, and the instrumentation system - are considered in a unified approach. This type of approach for the design of optimal control inputs and for determining the effect of the instrumentation system, in each case with respect to the identification process is discussed. Design of control inputs which otpimize the sensitivity of the system output to the unknown parameters is given. Results using these inputs in an extensive simulation of the identification process indicate they perform measurably better than doublet type inputs. A technique is then presented for specifying an optimal instrumentation system or for determining the effect, the instrumentation system has on the accuracy of the parameter estimates. Author

N74-25585* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECTS OF FLIGHT INSTRUMENTATION ERRORS ON THE ESTIMATION OF AIRCRAFT STABILITY AND CONTROL DERIVATIVES c01
Wayne H. Bryant and Ward F. Hodge *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 261-280 refs (For availability see N74-25569 15-02)
CSCL 01A

An error analysis program based on an output error estimation method was used to evaluate the effects of sensor and instrumentation errors on the estimation of aircraft stability and control derivatives. A Monte Carlo analysis was performed using simulated flight data for a high performance military aircraft, a large commercial transport, and a small general aviation aircraft for typical cruise flight conditions. The effects of varying the input sequence and combinations of the sensor and instrumentation errors were investigated. The results indicate that both the parameter accuracy and the corresponding measurement trajectory fit error can be significantly affected. Of the error sources considered, instrumentation lags and control measurement errors were found to be most significant. Author

N74-25586* Massachusetts Inst. of Tech., Cambridge. Decision and Control Sciences Group.
PARAMETER IDENTIFIABILITY OF LINEAR DYNAMICAL SYSTEMS c01
Keith Glover and Jan C. Willems (Groningen Rijksuniversiteit) *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 281-289 refs (For availability see N74-25569 15-02)
(Grant NGL-22-009-124)
CSCL 01A

It is assumed that the system matrices of a stationary linear dynamical system were parametrized by a set of unknown parameters. The question considered here is, when can such a set of unknown parameters be identified from the observed data? Conditions for the local identifiability of a parametrization are derived in three situations: (1) when input/output observations are made, (2) when there exists an unknown feedback matrix in the system and (3) when the system is assumed to be driven by white noise and only output observations are made. Also a sufficient condition for global identifiability is derived. Author

N74-25587* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A NEW CRITERION FOR MODELING SYSTEMS c01
Lawrence W. Taylor, Jr. *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 291-313 refs (For availability see N74-25569 15-02)
CSCL 01A

The criterion that is proposed is an expected value of the mean square response error as an alternative to testing a model against new data. Modeling with respect to this new criterion does not change the estimate for a given model format from a maximum likelihood estimate or mean square response error estimate. The new criterion does, however, provide a means of comparing models with different formats and varying complexity. A numerical example is used to illustrate the application of the proposed criteria and the problem of searching for the best model. For all but the most trivial system identification problems, it is shown that a prohibitive number of combinations of terms of the model must be investigated to ensure the final model is best. Author

N74-25588* Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering.
A PRACTICAL SCHEME FOR ADAPTIVE AIRCRAFT FLIGHT CONTROL SYSTEMS
Michael Athans and Dieter Willner *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 315-336 refs (For availability see N74-25569 15-02)
(Grants NGL-22-009-124; AF-AFOSR-2273-72)
CSCL 01C

A flight control system design is presented, that can be implemented by analog hardware, to be used to control an aircraft with uncertain parameters. The design is based upon the use of modern control theory. The ideas are illustrated by considering control of STOL longitudinal dynamics. Author

N74-25589* Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Control Criteria Branch.
ESTIMATION OF ELASTIC AIRCRAFT PARAMETERS USING THE MAXIMUM LIKELIHOOD METHOD
R. C. Schwanz and W. R. Wells *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 337-358 refs (For availability see N74-25569 15-02)
CSCL 01C

The application of the maximum likelihood method to estimate the aerodynamic parameters of elastic flight vehicles in a symmetric flight condition is discussed. In this application, particular attention is directed toward the center of mass, elastic deformation, and sensor equations of motion. It is shown that the two major computational problems to be overcome are the inversion of large-sized matrices and the time-wise integration of a large number of linear, ordinary, differential equations. Author

N74-25590* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Flight Control Systems.
ESTIMATION OF STRUCTURAL PARAMETERS FROM DYNAMIC TEST DATA
B. M. Hall and M. S. Sholar *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 359-367 refs (For availability see N74-25569 15-02)

CSCL 01C

Parameters for a lumped linear model approximating a distributed elastic structure are determined from dynamic test data comprised of several mode shapes and frequencies. Measurement errors, nonlinear response, and nonmeasurable quantities such as mode slope components are accommodated. Some mass and stiffness parameters may be known accurately, whereas the remainder are to be estimated. The method entails minimizing a quadratic function of the difference between corresponding modes and frequencies of the theoretical model and the test specimen. This technique was applied to some actual vibration test data, and the special techniques that are required to overcome convergence problems are described. Author

N74-25591* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
DETERMINATION OF PROPULSION-SYSTEM-INDUCED FORCES AND MOMENTS OF A MACH 3 CRUISE AIRCRAFT
Glenn B. Gilyard *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 369-374 refs (For availability see N74-25569 15-02)
CSCL 01C

During the joint NASA/USAF flight research program with the YF-12 airplane, the Dutch roll damping was found to be much less during automatic inlet operation than during fixed inlet operation at Mach numbers greater than 2.5 and with the yaw stability augmentation system off. It was concluded that the significant reduction in Dutch roll damping was due to the forces and moments induced by the variable-geometry features of the inlet. Two stability-derivative extraction techniques were applied to the flight data; the recently developed Newton-Raphson technique and the time vector method. These techniques made it possible to determine the forces and moments generated by spike and bypass door movement. Author

N74-25592* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYSTEMS IDENTIFICATION - REPRISE AND PROJECTIONS **c01**
Lawrence W. Taylor, Jr. *In its* Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 375-379 (For availability see N74-25569 15-02)
CSCL 01A

A state-of-the-arts review is given for the field of system identification. Progress in the field is traced from the early models of dynamic systems by Sir Isaac Newton up to the present day use of advanced techniques for numerous applications. D.L.G.

N74-25593* California Univ., Los Angeles. Dept. of System Science.
SOME AFTER-DINNER REFLECTIONS ON SYSTEM IDENTIFICATION **c01**
A. V. Balakrishnan *In* NASA. Flight Res. Center Parameter Estimation Tech. and Appl. in Aircraft Flight Testing Apr. 1974 p 381-385 (For availability see N74-25569 15-02)
CSCL 01A

The growth of the field of system identification is discussed along with changes in methodology which have taken place in recent years. The similarity between pattern recognition and system identification is pointed out, involving the modelling in the latter and the feature selection problem in the former. It is stated that once a model is formulated, including the disturbances and measurement errors, the parameter finding can be formulated as a statistical estimation problem. The various techniques and their application are discussed. D.L.G.

N74-25594*# Kanner (Leo) Associates, Redwood City, Calif.
GENERAL PRINCIPLES OF DESIGNING CONTROL SYSTEMS
O. A. Chembrovskiy, Yu. I. Topcheyev, and G. V. Samoylovich Washington NASA May 1974 391 p refs Transl. into ENGLISH from "Obshciye Printsipy Proyektirovaniya Sistem Upravleniya" Moscow, Mashinostroyeniye Press, 1972 416 p
(Contract NASw-2481)
(NASA-TT-F-782) Avail: NTIS HC $8.25 CSCL 01C

General methods for the initial stages of designing control systems of aircraft, missile, and spacecraft complexes are presented. The methods are based on statistical estimates of the characteristics of flight craft and of ground and onboard control system components. Illustrations are taken from foreign technology. Failure rates and standby status of the control systems of aircraft and missile complexes are discussed. Cost effectiveness criteria in the designing of attack and defense aircraft-missile complexes are described and evaluated with examples. Handbook material presented in the book can be used in the initial stage of designing or in setting up preliminary requirements for systems. The book is written for design engineers and estimator engineers concerned with designing flight craft control systems. Author

N74-25595# Naval Air Test Facility, Lakehurst, N.J. Ship Installations.
EVALUATION OF THE AUTOMATIC JBD (JET BLAST DEFLECTOR) SYSTEM Final Report, 19 Sep. 1973 - 15 Jan. 1974
William F. Kappler, Jr. 28 Feb. 1974 19 p refs
(AD-775665; NATF-EN-1130) Avail: NTIS CSCL 01/2

The report presents the results of the final evaluation testing of the Automatic JBD (Jet Blast Deflector) System on the MK 4 Mod O Jet Blast Deflector Panel located on the TC13 Mod 1 catapult at the Naval Air Test Facility, Lakehurst, N. J. and includes an analysis of the test procedures, problem areas, and reliability of the Automatic JBD System. (Modified author abstract) GRA

N74-25596# Stanford Research Inst., Menlo Park, Calif.
EVALUATION OF THE LIDAR TECHNIQUE OF DETERMINING SLANT RANGE VISIBILITY FOR AIRCRAFT LANDINGS OPERATIONS Final Report, Part 2, 1 Nov. 1972 - 1 Aug. 1973
William Viezee, John Oblanas, and Ronald T. H. Collis Nov. 1973 138 p refs
(Contract F19628-71-C-0152; AF Proj. 6670)
(AD-776054; AFCRL-TR-73-0708) Avail: NTIS CSCL 01/2

The report presents and interprets the data from an experiment specifically designed to more precisely evaluate the lidar technique of measuring slant-range visibility. The evaluation experiment was conducted at Travis AFB, California, in January 1973. The primary instruments were a pulsed ruby lidar and four transmissometers installed on towers and aligned along horizontal and slant paths. Also, arrays of three passive reflectors or targets (two wire-mesh and one solid) were used to provide a measure of attenuation over the distance between targets by comparing the intensity of the target-reflected lidar signals. Single-ended lidar backscatter measurements were made alongside the transmissometer. Daytime visual range was computed from the lidar observations by the slope method. (Modified author abstract) GRA

N74-25597# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
CATAPULT FATIGUE TEST OF THE MODEL C-2A AIRPLANE Final Report
Edward F. Kautz 31 Dec. 1973 33 p refs
(AD-775615; NADC-73179-30) Avail: NTIS CSCL 01/3

A laboratory fatigue test was performed on a C-2A airframe to determine whether the airframe could sustain the effects of 3000 catapult launches. A total of 6000 catapult launch cycles were applied to the airframe with no structural failures. With a test scatter factor of 2, the 6000 test cycles are equivalent to 3000 service catapult launches. Author (GRA)

N74-25598# Southwest Research Inst., San Antonio, Tex.
AERODYNAMIC DAMPING OF VIBRATING HELICOPTER ROTORS Final Report, 11 Jun. 1970 - 21 Dec. 1973
R. L. Bass, III, J. E. Johnson, and J. F. Unruh Jan. 1974 65 p refs
(Contract DAHC04-70-C-0050; SwRI Proj. 02-2865; AROD Proj. 9055-E)
(AD-775929; SwRI-02-2865-F; AROD-9055-1-E) Avail: NTIS CSCL 01/3

An experimental and theoretical study of aerodynamic damping of a hingeless helicopter rotor harmonically excited in heave in one of several bending modes is presented. Experimental damping data is given for rotor pitch angles of 0, 1 and 5 degrees. At each pitch angle, damping data is presented for a wide range of the oscillation to rotational frequency ratio, m. Rotor structural damping as a function of rpm is also determined so an accurate measure of aerodynamic contributions to total rotor damping is obtained. Theoretical aerodynamic damping is determined by treating the model rotor as a multi-degree of freedom system wherein the structural and aerodynamic properties of the rotor are treated as a series of finite structural elements and a series of two-dimensional strip theory aerodynamic panels. (Modified author abstract) GRA

N74-25599# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

QUALIFICATION TEST METHODS FOR HELICOPTER CARGO HANDLING SYSTEMS Final Report, Feb. - Nov. 1972

David O. Adams Dec. 1973 243 p refs
(Contract DAAJ02-72-C-0037; DA Proj. 1F1-62203-AA-33)
(AD-776991; SER-50795; USAAMRDL-TR-73-77) Avail: NTIS CSCL 01/3

The unreliability of some current cargo handling systems has resulted in the loss of expensive military equipment. Additionally, the unavailability of aircraft and the many maintenance man-hours on cargo handling systems have caused increased costs and mission aborts. The basic reason for this has been a lack of appreciation, by both the Army and the helicopter manufacturer, for the rigors of cargo helicopter operation. Southeast Asia experience has shown that rough handling and the combined effects of extreme environmental conditions and operational cycles are the leading causes of cargo handling system failures. The purpose of the report is to present cargo handling system qualification test methods which better represent actual field use and to systematize methods for demonstrating stated reliability requirements for these devices. (Modified author abstract) GRA

N74-25600# Defense Systems Management School, Fort Belvoir, Va.

RETURN TO LIGHTER-THAN-AIR TRANSPORTATION FOR MILITARY AND CIVILIAN APPLICATION Student Study Report

Richard M. Stepler Nov. 1973 55 p refs
(AD-776363; DSMS-PMC-73-2) Avail: NTIS CSCL 01/3

The United States aerospace community has entered an era characterized by declining activity, due largely to the increasing complexity and cost of aerospace systems. Industry and Government are engaged in a search for air vehicles that will carry increasingly larger payloads at reduced cost and levels of pollution, and that will not require vast expanses of land from which to operate. To this end, the dirigible (rigid airship), a versatile and ecologically clean transportation system which offers exceptional payload capability, endurance, range and flight stability, may be given renewed consideration. Author (GRA)

N74-25601# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

OPTIMAL CONTROL AIRCRAFT LANDING ANALYSIS Technical Report, Jan. 1972 - Jul. 1973

Robert E. Huber, Jr. Dec. 1973 136 p refs
(AD-776316; AFFDL-TR-73-141) Avail: NTIS CSCL 01/2

A digital computer analysis technique was developed to predict aircraft longitudinal landing performance to touchdown. A microwave landing system provided sampled data elevation angle guidance and assumed continuous DME (distance measuring equipment) information. The linearized longitudinal equations for perturbations about trimmed flight were used for the aircraft model. Atmospheric disturbances including deterministic winds and random gusts were modeled. The deterministic gusts included headwinds and wind shears. The random gusts included longitudinal and normal gusts which were modeled as first order Gauss Markov processes. The microwave landing system noise was also included. (Modified author abstract) GRA

N74-25602# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.

APPLICATION OF PRACTICAL OPTIMAL CONTROL THEORY TO THE C-5A LOAD IMPROVEMENT CONTROL SYSTEM (LICS) Final Report, 15 Aug. - 15 Sep. 1972

Albert J. VanDierendonck, Charles R. Stone, and Michael D. Ward Oct. 1973 49 p refs
(Contract F33615-72-C-2008; AF Proj. 487T)
(AD-776297; F0161-FR-Vol-3; AFFDL-TR-73-122) Avail: NTIS CSCL 01/3

Practicalizing quadratic optimal control algorithms were used to design load relief systems for the C-5A, a large flexible aircraft. The predicted rms stresses at the wing root were reduced by more than 40 percent. Handling qualities or stability were not compromised. The control is realized with a gyro and three accelerometers affecting ailerons and elevator two accelerometers more than an existing stability augmentation system. The quadratic performance index is defined to enforce good handling qualities and to limit the control system bandwidth. Author (GRA)

N74-25603# National Aviation Facilities Experimental Center, Atlantic City, N.J.

AEROSPACE VEHICLE HAZARDS PROTECTION PROGRAM: DETECTORS MATERIALS FUEL VULNERABILITY Final Technical Report, 10 Oct. 1970 - 30 Sep. 1972

John H. ONeill, Daniel E. Sommers, and Eldon B. Nicholas Oct. 1973 63 p refs
(Contract F33615-71-M-5002; AF Proj. 3048)
(AD-776301; FAA-NA-73-63; AFAPL-TR-73-87) Avail: NTIS CSCL 01/3

Fire tests were conducted in a turbojet powerplant installation to determine the effectiveness of an Edison and a Honeywell Ultra-violet Fire Detection System. A study of flammability and smoke generation characteristics was performed on different types of litter pads and pillows. Fire resistance tests in a standard 2,000F flame-test environment were conducted on two flexible self-sealing low pressure Aeroquip hoses and an aluminized asbestos-faced flexible fiberglas cloth. An investigation of the vulnerability of JP-4 and JP-8 fuel, contained in a fuel tank, to ignition by incendiary gunfire was made. (Modified author abstract) GRA

N74-25604# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.

VIBRATION SIGNAL ANALYSIS TECHNIQUES Final Report, 1 Jul. 1972 - 15 Jun. 1973

Donald R. Houser and Michael J. Drosjack Dec. 1973 246 p refs
(Contract DAAJ02-72-C-0085; DA Proj. 1F1-62203-A-434)
(AD-776397; USAAMRDL-TR-73-101) Avail: NTIS CSCL 01/3

The program was initiated to investigate the many means of using vibration signals to detect the condition of mechanical components, with particular emphasis on gears and bearings in the helicopter power train. An exhaustive literature search was performed in which specific techniques were identified. Several visits were made to people active in the vibration diagnostics field. The techniques which were identified as being potentially useful were investigated in detail. The results of this investigation include a presentation of the art of each technique and an analysis via actual helicopter data, test rig data, and a dynamic model simulation. The techniques have been broken down by mathematical function, i.e., time domain and frequency domain, and also by the components being monitored, i.e., gears or bearings. Both mechanically related and pattern recognition techniques are discussed. An extensive reference listing and a listing of companies and agencies active in diagnostics work are included. (modified author abstract) GRA

N74-25605# Army Aviation Systems Command, St. Louis, Mo.

MAJOR ITEM SPECIAL STUDY (MISS). CH-47A ROTARY WING BLADE Interim Report, Jan. 1964 - Jul. 1973

Mar. 1974 23 p
(AD-776419; USAAVSCOM-TR-74-15) Avail: NTIS CSCL 01/3

The report is designed to illustrate cost savings which would result from specific efforts in the areas of product improvement in quality and design. For the purpose of this study the cost savings produced in the area of product improvement are based on total elimination of a certain failure mode or modes. Appropriate modes are chosen because of their proportion of the total removals or their proportion in combination with other similar modes. These eliminated removals are then assumed to follow the distribution of the remaining removal modes. The actual cost savings are determined from the increase in the mean time to removal based on the new removal distributions. GRA

N74-25606# Army Aviation Systems Command, St. Louis, Mo.
MAJOR ITEM SPECIAL STUDY (MISS). CH-47A SYNCHRONIZER SHAFT ASSEMBLY Interim Report, Jan. 1964 - Jul. 1973
Mar. 1974 22 p refs
(AD-776418; USAAVSCOM-TR-74-14) Avail: NTIS CSCL 01/3

Major Item Special Study (MISS) reports are performed on DA Form 2410 reportable components. These are time change items and certain condition change items selected because of high cost or need for intensive management. Basically, the MISS reports are concerned with analyzing reported removal data presented in the Major Item Removal Frequency (MIRF) report. The failure modes reported for each removal are examined and grouped into categories which are intended to clarify the intent of the data reporting. From this data, removal distributions can be plotted and an MTR (mean time to removal) can be calculated. The MISS reports then investigate possible cost savings based on total elimination of selected failure modes. These modes are chosen because of the percentage of failures they represent and/or because they appear to be feasible Product Improvement Program (PIP) areas. Author (GRA)

N74-25607# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN INVESTIGATION OF TECHNIQUES FOR LAUNCHING LARGE BALLOON SYSTEMS FROM AIRCRAFT OR ROCKETS IN FLIGHT
Andrew S. Carten, Jr. 9 Oct. 1973 90 p refs
(AF Proj. 6665)
(AD-776779; AFCRL-TR-73-0633; AFCRL-IP-203) Avail: NTIS CSCL 01/3

The requirements for placing a military payload (communications relay, electro-optical sensor, etc.) in the sky at short notice are identified. A demonstration aircraft-launched balloon system is proposed and the basic assumptions defined. The balloon size and mass of inflatant to be carried aloft are calculated. Compressed gas and cryogenic storage systems are compared. The weight of storage tank/lift ratio is used to demonstrate the superiority of cryogenic storage. The properties of liquid helium and liquid hydrogen are discussed with respect to safe long term storage. The heat needed to vaporize the cryogens and to warm the resultant inflation gases is calculated. Methods of generating and transferring the required heat at the time of inflation are described. (Modified author abstract) GRA

N74-25608# Naval Postgraduate School, Monterey, Calif.
FY 73 HYDRAULIC RAM STUDIES Final Report, 1 Jul. 1972 - 30 Jun. 1973
A. E. Fuhs, R. E. Ball, and H. L. Power Feb. 1974 80 p refs
(AD-776536; NPS-57FU74021) Avail: NTIS CSCL 01/3

A report is made on the progress of FY 73 hydraulic ram studies. Preliminary analytical and experimental studies of the shock and cavity phases of hydraulic ram have been made to add to basic understanding of the fluid-structural interactions. The work should contribute to the understanding of the hydraulic ram phenomenon and provide useful information for designing survivable fuel tanks in aircraft. Author (GRA)

N74-25609# Bell Helicopter Co., Fort Worth, Tex.
ANALYSIS OF MANEUVERABILITY EFFECTS ON ROTOR/WING DESIGN CHARACTERISTICS Final Report
R. D. Foster, J. C. Kidwell, and C. D. Wells Feb. 1974 251 p refs
(Contract DAAJ02-70-C-0031; DA Proj. 1X1-64206-D-378)
(AD-776981; USAAMRDL-TR-74-26) Avail: NTIS CSCL 01/3

A parametric study was conducted to determine the effects of maneuverability requirements on the design characteristics of rotors and wings for helicopters. The study was performed for both single-rotor helicopters and single-rotor winged helicopters. Study results indicate that for typical UTTAS configurations, both winged and pure helicopters, designed for equal maneuvering capability, had equal payload capability. Therefore, for equal maneuvering capability, there was no discernible difference in weight or overall size. Winged configurations were more limited in their ability to achieve low (i.e., near zero) g, high-speed, maneuvering flight due to the difficulty in reducing wing lift sufficiently. (Modified author abstract) GRA

N74-25610# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE STRENGTH AND RIGIDITY OF STRUCTURES AT HIGH AIRCRAFT VELOCITIES
P. G. Zykin 7 Mar. 1974 17 p refs Transl. into ENGLISH from Tr. Aviats. Inst., Ufa (USSR), no. 7, 1967 p 3-12
(AD-776743; FTD-HT-23-395-74) Avail: NTIS CSCL 01/3

The effects of aerodynamic heating at supersonic and hypersonic speeds on the structural stability of airframes are discussed. Diagrams are proveded to show the nature of the change in temperature of aircraft skin in various flight regimes. Graphs are developed to show the change in yield point and the elastic modulus of aircraft structural materials as a function of temperature. Construction techniques for reducing the effects of aerodynamic heating are reported. Author

N74-25611# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
HELICOPTER/TECHNOLOGY PROGRAM: FISCAL 1973 Progress Report
Peter S. Montana Sep. 1973 105 p refs
(WF41421201)
(AD-776580; TN-AL-310) Avail: NTIS CSCL 01/3

The current fiscal year:s effort in the Helicopter Technology Program was directed toward the development of a design methodology for helicopter fuselages. Effort was concentrated in the development and utilization of computer programs to design a fuselage for a high speed helicopter in the 25,000 pound gross weight class. Particular emphasis was placed on minimizing flow separation in the rotor hub-pylon region of the vehicle. The flow separation in this region was previously determined to be the cause of up to fifty percent of current helicopter drag. Measureable success has been achieved in this regard. Progress has also been made in the development of a comprehensive wind tunnel investigation (currently under way) to verify analytical predictions and further refine the design methodology being developed. Author (GRA)

N74-25612# Army Aviation Systems Test Activity, Edwards AFB, Calif.
ENGINEERING FLIGHT TEST: AH-1G HELICOPTER WITH MODEL 212 TAIL ROTOR. PART 1: LOAD SURVEY Final Report, 19 Mar. - 9 May 1973
Leslie J. Hepler, Gary L. Skinner, Gary A. Smith, and Paul R. Bonin Jun. 1973 127 p refs 2 Vol.
(AD-776359; USAASTA-72-30-Pt-1) Avail: NTIS CSCL 01/3

The United States Army Aviation Systems Test Activity conducted a limited tail boom flight load survey of the AH-1G helicopter equipped with a Model 212 tail rotor. Tests were performed to obtain base-line tail boom load data with a tractor tail rotor installation, then repeated with the Model 212 tail rotor installed on the same helicopter. This installation included changes to the pitch links and pitch control tube to accommodate the Model 212 tail rotor; however, the remaining components of the tail rotor drive system were standard AH-1G items. (Modified author abstract) GRA

N74-25613# Army Aviation Systems Test Activity, Edwards AFB, Calif.
ENGINEERING FLIGHT TEST: AH-1G HELICOPTER WITH MODEL 212 TAIL ROTOR. PART 2: PERFORMANCE AND HANDLING QUALITIES Final Report, 29 May - 7 Aug. 1973
John I. Nagata, Gary L. Skinner, Leslie J. Hepler, Gary A Smith, and Paul R. Bonin Sep. 1973 120 p refs 2 Vol.
(AD-776360; USAASTA-72-30-Pt-2) Avail: NTIS CSCL 01/3

The United States Army Aviation Systems Test Activity conducted a limited performance and handling qualities evaluation of the AH-1G helicopter with a Bell Helicopter Company commercial Model 212 tail rotor installed. This installation included changes to the pitch links and pitch control tube to accommodate the Model 212 tail rotor; however, the remaining components of the tail rotor drive system were standard AH-1G items. The evaluation was performed during the period 29 May to 7 August 1973 at Edwards Air Force Base, Bakersfield, and Bishop, California. (Modified author abstract) GRA

N74-25614# Borst (Henry V.) and Associates, Rosemont, Pa.
SUMMARY OF PROPELLER DESIGN PROCEDURES AND DATA. VOLUME 3: HUB, ACTUATOR, AND CONTROL DESIGNS Final Report
Edward Sand, Douglas A. Elliott, Jr., and Henry V. Borst Nov. 1973 330 p refs
(Contract DAAJ02-72-C-0033; DA Proj. 1G1-62207-AA-72)
(AD-776998; USAAMRDL-TR-73-34C) Avail: NTIS CSCL 01/3

The technology needed for the design and installation of propellers is presented and summarized in three volumes. Volume 3 (Hub, Actuator, and Control Design) contains material on the design of the hub and actuator systems. The theories of propeller controls are presented with the details of the types used with conventional and V/STOL airplanes. A brief discussion of past and future propeller installations is given along with recommendations for future work. Design criteria, airfoil data, and a computer program are given. Author (GRA)

N74-26107 Technischen Universitaet, Munich (West Germany).
RESEARCH IN GERMANY ON FLUID-DYNAMICS OF AIR POLLUTION RELATED TO AIRCRAFT OPERATIONS
Franz Hindelang, J. *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 27-30 (For availability see N74-26104 15-20)

N74-26108 Norwegian Inst. for Air Research, Kjeller.
PRELIMINARY NOTES ON LARGE SCALE MASS TRANSPORT
J. Nordo *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 33-40 (For availability see N74-26104 15-20)

N74-26109 Department of Trade and Industry, London (England). Civil Aviation.
AIR POLLUTION FROM AIRCRAFT
R. A. Mangiarotty *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 41-54 refs (For availability see N74-26104 15-20)
Avail: NTIS

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-25615*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
COMPARISON AND EVALUATION OF POWER PLANT OPTIONS FOR GEOSYNCHRONOUS POWER STATIONS. PART 1: SYNCHRONOUS SOLAR POWER Final Report
J. R. Williams [1973] 47 p refs
(Grant NGR-11-002-181)
(NASA-CR-138493) Avail: NTIS HC $5.50 CSCL 10A

The present state-of-the-art is described for the development of solar power generators in far out synchronous orbit for power generation. Concepts of geosynchronous solar power satellites are discussed including photovoltaic arrays for power satellites, solar-thermal power satellites, and power transmission to earth. F.O.S.

N74-25616# Arizona Univ., Tucson. Optical Sciences Center.
CHEMICAL VAPOR DEPOSITION RESEARCH FOR FABRICATION OF SOLAR ENERGY CONVERTORS Annual Progress Report, 1 Jan. - 31 Dec. 1973
B. O. Seraphin 31 Jan. 1974 83 p refs
(Grant NSF GI-36731X)
(NSF/RANN/SE/GI-36731X/PR/73/3) Avail: NTIS HC $7.25

A research on selective solar energy convertor that can be used to transform solar radiation into high temperature heat. This heat can be transferred and applied in a stream turbingenerator unit to produce electricity. The selective solar energy convertor is basically a two-layered construction in which the top layer is a semiconductor material, such as silicon, having high absorption for solar radiation and high transparency for blackbody radiation from the heated unit. The bottom layer is a metal film having high reflectance. Author

N74-25617*# Scientific Translation Service, Santa Barbara, Calif.
WIND GENERATING STATIONS UNDER JOINT OPERATIONAL CONDITIONS
A. Kroms Washington NASA Jun. 1974 32 p refs Transl. into ENGLISH from A Bull. Schweiz. Elektrotech. Ver. (Zurich), v. 45, 1954 p 135-144
(Contract NASw-2483)
(NASA-TT-F-15637) Avail: NTIS HC $4.75 CSCL 10A

The following topics are discussed: wind power generators in combined operation; fundamentals of wind power as energy source and of its characteristics; structural features of generators; the feasibility of combined wind power and hydraulic power station; and the economic outlook for wind power. A bibliography is included. Author

N74-25618*# Scientific Translation Service, Santa Barbara, Calif.
STATISTICAL SUMMARY AND EVALUATION ON ELECTRIC POWER GENERATION FROM WIND POWER STATIONS
Dimitri R. Stein Washington NASA 6 Jun. 1974 23 p refs Transl. into ENGLISH from Elektrizitaetswirschaft (Frankfurt am Main), v. 50, no. 10, 11 Oct. 1951 p 279-285
(Contract NASw-2483)
(NASA-TT-F-15651) Avail: NTIS HC $4.25 CSCL 10A

The technical developments and utilization of wind powered generating systems are discussed. A table of data is presented to show the energy production of Danish wind powered generation stations from 1941 to 1944. A statistical evaluation of the energy production by wind powered generators is provided. The characteristics of the power generation stations and the method for transmitting the power are described. Author

N74-25619*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPUTER PROGRAM TO DETERMINE GEOMETRIC PARAMETERS FOR THE AFM SOLAR ARRAYS
Edward M. Gaddy Apr. 1974 72 p ref
(NASA-TM-X-70656; X-711-74-121) Avail: NTIS HC $6.75 CSCL 10A

A computer program has been written to aid in the design of the A. E. M.-1 solar array and to determine the power that will finally be available from the array. The program will plot the array output as a function of the satellite's position in a given orbit and will calculate the average output over the orbit. Author

N74-25620# Committee on Aeronautical and Space Sciences (U. S. Senate).
SOLAR HEATING AND COOLING
Washington GPO 1974 277 p refs Hearing on S. 2658 and H.R. 11864 before Comm. on Aeron. and Space Sci., 93d Congr., 2d Sess., 25 Feb. 1974
(GPO-29-939) Avail: Comm. on Aeron. and Space Sci.

A Congressional hearing was conducted to investigate the use of solar energy to help alleviate the energy shortage. The bill under consideration would direct NASA in cooperation with other Federal agencies, to develop a commercial demonstration of the technology of solar heating and for the technology of combined solar heating and cooling. Testimony is provided by several scientists and technologists concerning the methods of using solar energy. Examples of solar energy conversion systems are provided. A cost analysis of the project was made. P.N.F.

N74-25621*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR ENERGY RESEARCH AND UTILIZATION
William R. Cherry May 1974 23 p refs
(NASA-TM-X-70660; X-704-74-139) Avail: NTIS HC $4.25

CSCL 10A

The role is described that solar energy will play in the heating and cooling of buildings, the production of renewable gaseous, liquid and solid fuels, and the production of electric power over the next 45 years. Potential impacts on the various energy markets and estimated costs of such systems are discussed along with illustrations of some of the processes to accomplish the goals. The conclusions of the NSF/NASA Solar Energy Panel (1972) are given along with the estimated costs to accomplish the 15 year recommended program and also the recent and near future budget appropirations and recommendations are included. Author

N74-25622# Locus, Inc., State College, Pa.
FILM AND BATTERY TESTS Final Report
W. Stover Feb. 1974 56 p
(Contract N00014-74-C-0129)
(AD-776234; Rept-74380-01-WRS-01) Avail: NTIS CSCL 11/9

The report presents results of tests on mechanical properties of biaxally oriented nylon film (Emblem) and Mylar film and on performance tests of lithium primary cells and silver-hydrogen secondary cells. GRA

N74-25623# Army Foreign Science and Technology Center, Charlottesville, Va.
HETERGENEOUS SOLAR CONVERTERS BASED ON POLYCRYSTALLINE CADMIUM SULFIDE AND SELENIDE
V. N. Komashchenko, A. I. Marchenko, and G. A. Fedorus 6 Nov. 1973 11 p refs Transl. into ENGLISH from Poluprov. Tekh. Mikroelektron. Akad. Nauk Ukr. SSR, Respub. Mezhvedom. Sb. (Moscow), no. 4, p 112-121
(AD-776551; FSTC-HT-23-1083-72) Avail: NTIS CSCL 10/2

Data are presented on the development and investigation of photoconverters based on pressed sintered tablets of CdS and CdSe, as well as some more detailed data on photoconverters based on CdSe films. Author

N74-25624# Thermo Electron Corp., Waltham, Mass.
A 3 KW CLOSED RANKINE-CYCLE POWERPLANT WITH A TURBINE EXPANDER Final Report, 20 Jun. 1972 - 2 May 1973
W. Peter Teagan and Warren Clay Sep. 1973 125 p ref
(Contract DAAK02-72-C-0554)
(AD-776982; TE4165-24-74) Avail: NTIS CSCL 10/2

The report describes the design of a 3 kw generator set driven by an organic Rankine cycle engine. Power is produced with a turbine-gearbox expander arrangement. The turbine speed of 70,200 rpm is geared down internally to the sealed system to 3,600 rpm so that a low speed shaft seal of proven performance can be used to transmit the turbine output to a standard military generator. The system is completely self-contained with controls designed to maintain working fluid cycle conditions and turbine speed constant and independent of load. The system uses an organic working fluid (Fluorinol-85) rather than water to avoid problems associated with freezing and high temperature lubrication. At full load the cycle operates with turbine inlet conditions of 530F and 480 psia and a condensing pressure of 29 psia (202F). Author (GRA)

N74-25625# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROSPECTS AND SCIENTIFIC PROBLEMS OF THE APPLICATION OF METHODS OF THE APPLICATION OF METHODS OF DIRECT ELECTRICAL POWER ACQUISITION FROM CHEMICAL FUELS
N. S. Lidorenko and G. F. Muchnik 21 Mar. 1974 29 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. i Transp. (Moscow), no. 2, 1973 p 15-27
(AD-776734; FTD-MT-24-2-74) Avail: NTIS CSCL 10/2

The fundamental prospects for the use of electrochemical generators, which convert the chemical energy of fuel into electrical energy are examined. The optimal areas of their application in comparison with other energy sources are determined. Comparisons are conducted for a series of criteria, including technical-economical. A survey is given of the fundamental problems (theoretical, experimental, technical) which appear in the process of creating ECG. GRA

N74-25626# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
RELATING GEOMETRICAL VARIABLES OF POROUS ELECTRODES
T. Katan and H. F. Bauman 28 Feb. 1974 21 p refs Submitted for publication
(Contract N00014-73-C-0397)
(AD-776652; LMSCI-D358403; TR-2) Avail: NTIS CSCL 07/4

A filamentary model of a porous mass is developed to show how geometrical variables are mutually related and can act as a guide in design and fabrication of porous battery electrodes. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-25627*# Webb Associates, Yellow Springs, Ohio.
CYCLES IN METABOLISM AND HEAT LOSS
James F. Annis, Samuel J. Troutman, and Paul Webb [1974] 63 p refs
(Contract NAS9-12683)
(NASA-CR-134293) Avail: NTIS HC $6.25 CSCL 06P

Using calorimetric techniques, subjects' metabolism, thermoregulation, and body temperatures were monitored continuously for 24-hour days, using three types of experimental routines. A water cooling garment (WCG) was used for direct calorimetry, while partitional calorimetry was used to establish a non-suited comparison for one of the routines. In this replicated routine, called the quiet day, the subjects were sedentary throughout the daytime hours and slept normally at night. Results indicate that the WCG may act to reduce 24-hour total oxygen consumption (VO2) or heat production, possibly due to the lowered energy cost of thermoregulation. Author

N74-25628*# Techtran Corp., Glen Burnie, Md.
BLOOD SUPPLY CHANGE IN THE AREA OF THE LOWER EXTREMITIES AS RESULT OF INACTIVITY AND ITS CONTROL BY TRASYLOL
P. Pauschinger, P. Matis, and H. Rieckert Washington NASA May 1974 8 p refs Transl. into ENGLISH from Medizinische Welt (Stuttgart), no. 51, Dec. 1968 p 2822-2824
(Contract NASw-2485)
(NASA-TT-F-15599) Avail: NTIS HC $4.00 CSCL 06S

A clinical study was made of blood circulation deceleration in the lower extremities in the case of lengthy immobilization. Data show that inactivity results in a decelerating increase in blood supply, increase in input into the venous storage corresponding to loss of reestablishing force of the peripheral venous system in the direction of a decrease in the peripheral reflux requirement, and an increased susceptibility to edema. Experimental tests show that, 400,000 E Trasylol i.v. effectively controls all the above symptoms. Author

N74-25629*# Linguistic Systems, Inc., Cambridge, Mass.
METABOLISM OF LIPIDS AND GLUCIDES IN THE WHITE RAT DURING TWO TYPES OF STRESS: FORCED IMMOBILIZATION AND HEAT VARIATIONS
M. Prioux-Guyonneau and L. Buchel Washington NASA Jun. 1974 11 p refs Transl. into ENGLISH from Compt. Rend. Soc. Biol. (Paris), v. 166, 17 Oct. 1972 p 1277-1283
(Contract NASw-2482)
(NASA-TT-F-15605) Avail: NTIS HC $4.00 CSCL 06P

The effects of restraint and sudden variation of environmental temperature on the lipid and glucide metabolism of rats were studied. In the free rat, cooling caused an increase in plasma-free fatty acid content and hyperglycemia. With animals kept in restraint and at normal temperature, a decrease occurred in the plasma-free fatty acid content and an increase occurred in glycemia. A combination of the two stresses did not change the plasma-free fatty acid content, but induced pronounced hypoglycemia and hypothermia. Author

N74-25630*# Scientific Translation Service, Santa Barbara, Calif.
BLOOD TEMPERATURE AND HEAT REGULATION
F. H. Koenig Washington NASA Jun. 1974 26 p refs
Transl. into ENGLISH from Arch. Ges. Physiol. (Berlin), v. 246, 1943 p 693-708
(Contract NASw-2483)
(NASA-TT-F-15630) Avail: NTIS HC $4.75 CSCL 06P

Mechanisms of human thermoregulation are considered. For purposes of the study the body was divided into a core and shell, each with its heat content, and with the shell serving as a cooler for the core. Heat can be transferred between core and shell in either direction. One major effect is that the difference between skin temperature and environmental temperature is reduced, preventing excessive heat flow in or out. Author

N74-25631*# Linguistic Systems, Inc., Cambridge, Mass.
CONTRIBUTION ON THE THERAPY OF SYSTEMIC LUPUS ERYTHEMATOSUS WITH A COMBINATION OF CYCLOPHOSPHAMIDE (ENDOXAN) AND CORTICOSTEROIDS
E. Muhl and A. Adorf Washington NASA Jun. 1974 9 p refs Transl. into ENGLISH from Med. Welt (Stuttgart), v. 25, no. 9, 1974 p 366-367
(Contract NASw-2482)
(NASA-TT-F-15657) Avail: NTIS HC $4.00 CSCL 06E

The course of a systemic Lupus erythematosus is described of a 27-year old female in which, after negative results with the methods of treatment customarily used up to now, a combined therapy of cortiscosteroids with a cytostat (Endozan) brought a decisive turn in the course of the disease and a hardly-expected results. The period of observation of this case extended over ten months, with initially 3 months of stationary treatment and, thereafter, 7 months of ambulatory treatment. Author

N74-25632*# Kanner (Leo) Associates, Redwood City, Calif.
SPINAL INJURY AFTER EJECTION
R. Auffret and R. P. Delahaye Washington NASA Jun. 1974 88 p refs Transl. into ENGLISH from the French report
(Contract NASw-2481)
(NASA-TT-F-15702) Avail: NTIS HC $7.50 CSCL 06P

Ejection statistics obtained from the air forces of seven nations are analyzed, including figures on the incidence of death, the incidence of fracture and multiple fractures, and preferential fracture sites. A basic review of the anatomy of the spine is followed by a discussion of the mechanics of spinal fracture. It is difficult to determine the stage of ejection at which fractures are most likely to occur -- expulsion from the aircraft or landing -- but the position of the pilot at the moment of ejection is considered to be of prime importance. A study of X-ray procedure deals in detail with the appearance of spinal fractures of varying degree and the characteristics distinguishing them from congenital abnormalities or the effects of disease. Treatment procedure is reviewed and the systematic use of X-ray examination is recommended. Finally, current standards for aircrew fitness are discussed, with the conclusion that in general these criteria are excessively strict. Author

N74-25633# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEM OF CORONARY INSUFFICIENCY IN PATIENTS SUFFERING FROM VIBRATION DISEASE CAUSED BY THE EFFECT OF GENERAL VIBRATION
A. G. Genkin 4 Feb. 1974 8 p refs Transl. into ENGLISH from Uch. Zap. Nauchno Issled. Inst. Gigieny (Moscow), 1968 p 46-48
(AD-775119; FTD-HT-23-1028-74) Avail: NTIS CSCL 06/19

From the first consultation with patients suffering from vibration disease one is struck by the number of complaints which might be associated with certain disturbances in the functional state of the cardiovascular system. Many molders complain of tachycardia, a sensation of interruption in the functioning of the heart, pains in the vicinity of the heart, and pains of an angiospastic nature in the arms and legs. The authors analyzed the complaints of 204 molders suffering from vibration disease caused by the effect of general vibration. GRA

N74-25634# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACE LEVKOI
Ya. Golovanov 25 Mar. 1974 7 p Transl. into ENGLISH from Komsomolskaya Pravda (USSR), no. 299, Dec. 1973 p 2
(AD-776944; FTD-HT-23-1531-74) Avail: NTIS CSCL 22/1

The flights of Soviet and American astronauts made it possible to note certain general regularities in well-being during the so-called transition period during the first days of flight when the organism is becoming adjusted to the conditions of weightlessness. Gravity is absent, the heart does not have to expend energy for raising the blood from the lower parts of the body to the upper. But the heart still doesn't know about this and it continues to pump blood as it pumped it on earth. There is a redistribution of blood. An excess of it, making up around eleven percent, flows into the chest cavity and into the brain. In some this redistribution doesn't have any effect on efficiency. Others experience a heaviness in the head, they become motion sick, and naturally it is more difficult for them to work in space. GRA

N74-25635# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONVERSATION WITH SPACE
B. Knonovalov 26 Mar. 1974 8 p Transl. into ENGLISH from Izv. (Moscow), no. 30, 26 Dec. 1973 p 3
(AD-776933; FTD-HT-23-1532-74) Avail: NTIS CSCL 22/1

Experiments being carried out on the effects of weightlessness on plants and animals are described on the Soyuz 13 flight. GRA

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-25636*# Howard Univ., Washington, D.C.
SUMMER INSTITUTE IN BIOMEDICAL ENGINEERING, 1973 Final Report
Eugene M. DeLoatch and Anna J. Coble Feb. 1974 107 p refs
(Grant NGT-09-011-051)
(NASA-CR-138462; X-207-74-103) Avail: NTIS HC $8.50 CSCL 06B

Bioengineering of medical equipment is detailed. Equipment described includes: an environmental control system for a surgical suite; surface potential mapping for an electrode system; the use of speech-modulated-white-noise to differentiate hearers and feelers among the profoundly deaf; the design of an automatic weight scale for an isolette; and an internal tibial torsion correction study. Graphs and charts are included with design specifications of this equipment. S.K.W.

N74-25637*# Industrial Ecology, Inc., Los Angeles, Calif.
THE DESIGN AND FABRICATION OF A PROTOTYPE TRASH COMPACTING UNIT Final Report
1 Apr. 1973 33 p
(Contract NAS1-11031)
(NASA-CR-134292) Avail: NTIS HC $4.75 CSCL 06I

A prototype trash compactor, that is compatible with the anticipated requirements of future long-term space missions, is described. Preliminary problem definition studies were conducted to identify typical types and quantities of waste materials to be expected from a typical mission. Bench-scale compaction tests were then conducted on typical waste materials to determine force/compaction curves. These data were used to design a boilerplate compactor that was fabricated to prove the feasibility of the basic design concept. A final design was then prepared from which the deliverable unit was fabricated. Design concepts are presented for suggested further development of the compactor, including a version that is capable of handling wet biodegradable wastes. Author

N74-25638# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
A CONCEPT OF OPERATOR WORKLOAD IN MANUAL VEHICLE OPERATIONS

D. W. Jahns Dec. 1973 48 p refs
(FB-14) Avail: NTIS HC $5.50; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. 10 DM

A conceptual structure (or model) of operator workload relying on the data available in workload literature is presented. The interrelationships among various workload assessment techniques are pointed out. It is concluded that each of the aspects of workload: input load, operator effort, and work result, must be quantitatively scaled before the complex problem of task interference and crew system design criteria in vehicle operations can be treated comprehensibly. Author (ESRO)

N74-25639# Defence Research Information Centre, Orpington (England).
PLASMA ARC WELDING AND PLASMA ARC CUTTING SEEN FROM THE VIEWPOINT OF INDUSTRIAL HEALTH
Hans Spelbrink Jan. 1974 11 p refs Transl. into ENGLISH from Zbl. Arbeitsmed., 1972/1973 p 76-80
(DRIC-Trans-3453; BR30727) Avail: NTIS HC $4.00

The changing concept of plasma to thermic plasma as seen by the natural scientist is explained. Basic technical and physical facts of plasma arc welding and cutting are briefly described so that possible health risks may be understood. Potential areas of technical application (temperatures up to 30.000 C) in thermochemistry, space technology, and surface welding are mentioned. Health risks which may be caused by excessive noise, ultraviolet radiation, and fumes, smoke, and gas formation are indicated various points are summarized in table form, presenting a synopsis of preventative measures for both outdoor and indoor work. Author (ESRO)

N74-25640# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE ROLE OF STEREOSCOPIC VISION IN GROUND TO GROUND TARGET ACQUISITION
W. A. Lotens and J. Walraven 1974 20 p refs
(Contract A72/KL/075)
(IZF-1974-2; TDCK-64149) Avail: NTIS HC $4.00

The role of stereoscopic vision in target detection was investigated at three light levels, varying from broad daylight to deep twilight. Three viewing conditions - binocular, biocular and monocular vision - were compared, using color slides of natural scenes with and without targets (camouflaged persons). The detection scores, expressed in a criterion free measure, show that under all three light levels tested, target detection is significantly better with stereoscopic vision than with biocular or monocular vision. Furthermore, stereoscopy did not degrade with decreasing light level in the luminance range used, thus indicating that stereoscopic vision is particularly advantageous in night vision. Author (ESRO)

N74-25641# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
ON THE TRAFFIC BEHAVIOR OF A MAN WITH HOMONYMOUS HEMIANOPSIA OF THE RIGHT HALF OF THE VISUAL FIELD [OVER HET VERKEERSGEDRAG VAN EEN MAN MET UITVAL VAN DE RECHTER HELFT VAN HET GEZICHTSVELD AAN BEIDE OGEN]
J. J. Vos 1974 19 p refs In DUTCH: ENGLSIH summary
(IZF-1974-3; TDCK-63804) Avail: NTIS HC $4.00

The functional handicap of a man with right sided homonymous hemianopsia driving an automobile is described. The handicap was investigated by a simulation experiment in the laboratory and with a real traffic task in an instrumented car. This is concluded that great compensation for this defect is shown. Author (ESRO)

N74-25642# Adviesbureau der Genie, The Hague (Netherlands).
CALCULATION OF DOSES OF NUCLEAR RADIATION CAUSED BY FALLOUT
W. VanEngelenburg Dec. 1973 36 p refs
(Rept-239; TDCK-63914) Avail: NTIS HC $5.00

Mellegers are used to calculate the dose of radioactive radiation received from fallout in the course of time under given conditions. Graphs are supplied. It was found that in an idealized fallout pattern 150 dose curves coincide with 150 dose rate curves. Author (ESRO)

N74-25643# Instrument Flight Center, Randolph AFB, Tex.
SUMMARY OF THE ALLOCATION OF CONTROL TASKS PROGRAM Final Report
Gerald C. Armstrong 7 Jan. 1974 18 p refs
(IPIS Proj. SP-74-1)
(AD-775696; IFC-TR-74-1) Avail: NTIS CSCL 05/9

The study of control-sharing was accomplished in five major steps. The first step addressed the feasibility of the shared control concept, wherein, one pilot flew pitch and power while the other controlled roll and yaw. The second step investigated the problem of what might be expected should the autopilot fail completely while employing shared control. The third step involved a study to determine the role of the copilot when autopilot failures occur. The fourth step examined the specific control responsibilities and control tasks for each pilot. The fifth step was a study to determine which control-sharing combinations produce precision through pilot unburdening and to define which crew duties provide control continuity when an AFCS failure occurs. GRA

N74-25644# Instrument Flight Center, Randolph AFB, Tex.
PRECISION AND UNBURDENING STUDY Final Report
Donald L. Carmack Dec. 1973 33 p
(AD-775699; IFC-TR-73-10) Avail: NTIS CSCL 05/9

The study was conducted to investigate pilot task allocations in conjunction with Automatic Flight Control Systems (AFCS) failure modes to identify crew procedures that provide greatest potential for performance and produce effective pilot unburdening. A series of six precision instrument approach sequences were flown to landings and go-arounds. The sequences contained twenty-five combinations of control conditions and crew procedures for the pilots to determine which combinations provided the greatest precision with the least burdening. During normal AFCS operation, the subject pilots agreed that the pilot should be assigned systems monitor and visual transition tasks and the copilot should be assigned the flight path monitor task. The copilot being heads-down, should be responsible for go-around execution. All pilots agreed that Force Wheel Steering was desirable for control inputs on final. All pilots felt that the task which allocated control of pitch, bank, power, and communications to one pilot during both manual and semiautomatic approaches was unacceptable. They unanimously expressed a desire for shared control when complete uncoupling or AFCS failure occurred. (Modified author abstract) GRA

N74-25645# Army Aeromedical Research Lab., Fort Rucker, Ala.
INSTRUMENT FLIGHT PREFERENCE AND FIELD DEPENDENCE
Eric R. George and Mark A. Hofmann Jan. 1974 38 p refs
(DA Proj. 3A0-62110-A-819)
(AD-776373; USAARL-74-8) Avail: NTIS CSCL 05/10

Research is reported on the possible relationship between field dependence-independence, as measured by the rod and frame test (RFT), and aviator attitudes regarding IFR flight. The degree of aviator preference for actual instrument flight, determined by questionnaires and personal interviews, served as the basis for division of an aviator sample of 43 pilots into high and low preference groups. These groups were examined relative to each of the three field dependency measures derived from RFT performance. In addition, demographic data of both subject groups were reduced and examined. (Modified author abstract) GRA

N74-25646# Modern Army Selected Systems Test Evaluation and Review, Fort Hood, Tex.
PERSONNEL HOMING SYSTEM TEST REPORT ANALYSIS Final Analysis Report
Morris G. Strickland 20 Mar. 1974 52 p refs
(AD-776935; MASSTER-TEST-1066) Avail: NTIS CSCL 17/3

The test was conducted to determine, through use of the Motorola prototype, if a personnel homing system (PHS) has significant military potential and to obtain insight into the desirable features of a PHS for the purpose of assembling parachutists or other forces in overt and covert operation or for alternate usages. Because of the technical difficulties of the PHS, it should not be considered for further testing until shortcomings noted in the test report analysis are corrected. Author (GRA)

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-25647*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
A SURVEY OF COMPATIBILITY OF MATERIALS WITH HIGH PRESSURE OXYGEN SERVICE Final Report
J. G. Hust and A. F. Clark Oct. 1972 178 p refs
(NASA Order H-92180A)
(NASA-CR-120221; Rept-275.03-72-11) Avail: NTIS HC $12.00 CSCL 07D

The available information on the compatibility of materials with oxygen as applied to the production, transport, and applications experience of high pressure liquid and gaseous oxygen is compiled. High pressure is defined as about 2000 to 3000 psia. Since high pressure projections sometimes can be made from lower pressure data, some low pressure data are also included. Low pressure data are included if they are considered helpful to a better understanding of the behavior at high pressures. Author

N74-25648*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENHANCEMENT OF OXIDATIVE VAPORIZATION OF CHROMIUM (III) OXIDE AND CHROMIUM BY OXYGEN ATOMS
George C. Fryburg, Fred J. Kohl, and Carl A. Stearns Washington May 1974 28 p refs
(NASA-TN-D-7629; E-7789) Avail: NTIS HC $3.25 CSCL 07B

Rates of oxidative vaporization of Cr2O3 were found to be markedly enhanced in the presence of O atoms. Investigations were conducted over the temperature range 470 to 1520 K. For Cr2O3 the enhancement was about 10 to the 9th power at 820 K in oxygen containing 2.5 percent atoms. Rapid oxidative vaporization of bare chromium was observed below 1070 K, the rate being about one-half that of Cr2O3. Results are interpreted in terms of thermochemical analysis. Author

N74-25649*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CATALYTIC OXIDATION OF TRACE LEVELS OF METHANE IN OXYGEN IN A TUBULAR REACTOR
Marvin Warshay and Christopher L. Caenepeel Washington Jun. 1974 21 p refs
(NASA-TN-D-7687; E-7595) Avail: NTIS HC $3.00 CSCL 07C

An experimental investigation of catalytic oxidation of trace levels of methane in oxygen was conducted in a tubular reactor. Two noble metal solid catalysts were explored: a 1-percent platinum on gamma alumina and a 0.5-percent rhodium on gamma alumina. For each catalyst the activity was determined as a function of temperature, pressure, space velocity, and methane concentration. The rhodium catalyst was considerably more active than the platinum catalyst. For each catalyst mass transfer had a pronounced effect upon activity at low space velocity. Author

N74-25650# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE INVESTIGATION OF THE LUMINESCENCE OF EUROPIUM AND TERBIUM IN ZINC SELENIDE-CHLORIDE SYSTEMS
M. M. Pinaeva and G. F. Pinaev Feb. 1973 6 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR (Minsk), v. 16, no. 1, 1972 p 81-84
(NTC-74-11900; Rept-73-57) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The interaction between zinc selenides and the components of zinc chloride melts were investigated. Conclusions were drawn that it was possible to form complexes of singly-charged cathions and anions in the molten zinc selenide-chloride system on the basis of the investigation of the luminescence spectra of europium and terbium ions introduced in the system and the comparison of this data with the results of X-ray analyses. Author

N74-25651# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
CORROSION OF COMMERCIAL ALLOYS IN THREE ENVIRONMENTS SIMULATING PHOSPHATE ROCK ACIDULATION
Laurance L. Oden and Boyd D. Nash 1974 13 p refs
(BM-RI-7898) Avail: NTIS HC $4.00

Corrosion tests were conducted on 18 commercial alloys in H3PO4-phosphate rock or Al2O3 slurry, in 10 percent HF, and in 25 percent H2SiF6 to simulate three environments anticipated in a process to extract fluoride values from phosphate rock. Small alloy coupons were rotated in duplicate tests, at 4.4 to 21 fps in the slurry at 170 C, to determine rates of erosion-corrosion. At 4.4 fps, the lowest rates were measured in mils penetration per year (mpy) for Hastelloy C-276, Hastelloy B, and inconel 625. The corrosion rate for all alloys exceeded 40 mpy in either the equilibrium vapor or liquid phases of aqueous solutions containing 10 percent HF or 25 pct H2SiF6 at 100 C. Author

N74-25652*# Scientific Translation Service, Santa Barbara, Calif.
A METHOD OF CATALYTIC REMOVAL OF ORGANIC AND CARBON MONOXIDE FROM GASES
J. Wojciechowski, Z. Gortel, E. Grzywa, and J. Kopytko Washington NASA Jun. 1974 7 p Transl. into ENGLISH from Polish Patent no. 57512 (Appl. no. P 119869, 6 Apr. 1967) 2 p
(Contract NASw-2483)
(NASA-TT-F-15648) Avail: NTIS HC $4.00 CSCL 07D

The object of this invention is a method of removal, through catalytic combustion, of organic impurities and carbon monoxide from the flue gases of industrial plants and from the exhaust gases of internal combustion motors. Author

N74-25653*# Kanner (Leo) Associates, Redwood City, Calif.
MASS-SPECTROMETRIC DETERMINATION OF SURFACE CONTAMINANTS
V. P. Bedrinov, V. I. Belousov, and N. V. Khromova Washington NASA Jun. 1974 12 p refs Transl. into ENGLISH from Zh. Anal. Khim. (USSR), v. 28, no. 12, 1973 p 2407-2412
(Contract NASw-2481)
(NASA-TT-F-15708) Avail: NTIS HC $4.00 CSCL 07D

A mass-spectrometric method was developed for determination of overall amount of surface contamination. Accuracy of the method was estimated by the added-found method, in analysis of silicon and gallium arsenide plates. The content of impurity elements on the surfaces of silicon plates after special cleaning and preservation procedures was determined. Author

N74-25654# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
FITTING THE NUMERICAL POTENTIAL HYPERSURFACE OF KUTZELNIGG ET AL FOR THE Li(PLUS)-H2 SYSTEM
H. Fremerey and G. M. Kendall Jan. 1974 55 p refs
(Rept-1/1974) Avail: NTIS HC $5.75; Max-Planck-Inst. fuer Stroemungsforsch., Goettingen, West Ger. 15 DM

The results of the numerical fitting of potential energy hypersurfaces of the Li(+)/H2 system using the Kutzelnigg data are presented. The potential function is divided in an interactive and asymptotic part. Results are given for linear and C2V configurations. Cubic spline and least squares methods were used for interpolation and fitting. ESRO

N74-25655# National Physical Lab., Teddington (England). Div. of Chemical Standards.
A COMPARISON OF METHODS AVAILABLE FOR THE ESTIMATION OF ENTHALPIES OF FORMATION FOR DOUBLE OXIDE SYSTEMS
W. Slough Oct. 1973 21 p refs
(NPL-Chem-25) Avail: NTIS HC $4.25

The methods of Sladek, Le Van, and Slough were used to estimate unknown standard enthalpies of formation for double oxide systems which have been added to the NPL metallurgical thermodynamic computer databank. The limitations of the three methods are discussed. ESRO

N74-25656# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
THE DETERMINATION OF FLUORIDES IN THE ATMOSPHERE Final Report [DE BEPALING VAN FLUORIDEN

IN DE ATMOSFEER]
J. Kaaijk 1973 25 p refs In DUTCH; ENGLISH summary
(CL-1973-22; TDCK-63839) Avail: NTIS HC $4.25

An automatic fluoride analyzer which monitors atmospheric fluorides in a continuous way is described. The reduction of the water consumption, the collection of particulate fluorides, and the exactness of the measurements was investigated. A prototype was developed in cooperation with Instrumentum TNO. With this device atmospheric fluoride measurements were carried out. The measurements with the fluoride analyzer were compared with measurements on impregnated filters, carried out by the Research Institute for Public Health Engineering TNO. At the same time the alteration of the calibration curve and the temperature in the measuring cell were investigated as a function of time. Author (ESRO)

N74-25657# California Univ., Los Angeles. Dept. of Chemistry.
THE DETERMINATION OF THE STRUCTURE OF LOW TEMPERATURE TRIPLET ENERGY TRAPS USING PMDR METHODS. 1: THE MAGNETIC AXES OF HEXACLOROBENZENE EXCIMERS
M. A. El-Sayed, C. T. Lin, and R. Leyerle Mar. 1974 23 p refs
(Contract N00014-69-A-0200-4012; NR Proj. 056-948)
(AD-776268; TR-18) Avail: NTIS CSCL 07/4

Using linearly polarized microwave radiation, the optically detected microwave signal of the zerofield transitions of the hexachlorobenzene broad excimer type emission is studied as a function of the angle between the microwave H vector field and the crystal axes. The dependence of the PMDR signal on the angle between the H vector field of the linearly polarized microwave and crystal axes is examined. From these studies, the exact orientation of the three orthogonal magnetic axes of a phosphorescent triplet state in a single crystal host can be elucidated if three microwave polarization ratios are determined. The method is applied to determine the principal magnetic axes of the triplet state giving rise to the excimer type emission of the hexachlorobenzene crystal at 1.6K. Author (GRA)

N74-25658# Physical Dynamics, Inc., Detroit, Mich.
SUBSTITUTED HYDRAZINE CHEMISTRY AND CHEMILUMINESCENCE IN HIGH ALTITUDE PLUMES Interim Report
Ralph H. Kummler, Edward R. Fisher, and Frederick P. Boynton Aug. 1973 52 p refs
(Contract F19628-72-C-0006; ARPA Order 1856; AF Proj. 8692)
(AD-776040; PD-73-041; AFCRL-TR-73-0727; SR-4) Avail: NTIS CSCL 07/4

Hydrazine and amine based fuels are shown to undergo highly exothermic oxidation reactions which can be a major source of infrared energy under conditions appropriate to high altitude plume afterburning. In low pressure, high oxygen atom environments, a single step, highly exothermic mechanism is capable of initiating the emission of infrared radiation. A specific set of reactions and energy transfer processes which characterize this potential emission are presented and an extensive review of the current literature related to amine oxidation is included. A flow field calculation directed toward testing the importance of chemiexcitation in amine afterburning is presented. (Modified author abstract) GRA

N74-25659# Tennessee Univ., Knoxville. Dept. of Physics and Astrononomy.
ANALYSIS OF VIBRATION-ROTATION SPECTRA OF METHANE Final Report, 1 Nov. 1971 - 31 Oct. 1973
Kenneth Fox 31 Jan. 1974 74 p refs
(Contract F19628-72-C-0111; AF Proj. 7670)
(AD-776061; UTPA-ERAL-04; AFCRL-TR-73-0738) Avail: NTIS CSCL 07/4

The report describes the data on methane provided for the compilation of spectroscopic parameters for several infrared-active molecules occurring naturally in the terrestrial atmosphere. Vibration-rotation bands of (12C)H4 and (13C)H4 in the 1 to 8.5 micrometer region were considered. Details, including conventions in notation, are given for the following parameters compiled for each spectral line: spectral position, absolute intensity, half-width, energy of the initial state of the transition, initial- and final-state rotational and vibrational quantum numbers, and isotopic species. References are provided to indicate the sources of experimental measurements and theoretical calculations. (Modified author abstract) GRA

N74-25660# General Electric Co., Philadelphia, Pa. Space Div.
DEFENSE NUCLEAR AGENCY REACTION RATE HANDBOOK, SECOND EDITION, REVISION NUMBER 3
M. H. Bortner, R. H. Kummler, and T. Baurer 1 Sep. 1973 48 p refs Revised Prepared in cooperation with Wayne State Univ.
(Contracts DASA01-70-C-0082; DASA01-71-C-0145; DNA Proj. NWED-HD-028)
(AD-776650; DNA-1948H-Rev-3) Avail: NTIS CSCL 07/4

This chapter presents a summary of reactions, with suggested rate coefficients, relevant to the problems of atmospheric chemical recovery following a perturbation. GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-25661 California Univ., Los Angeles.
COMMUNICATION IN THE PRESENCE OF INTERSYMBOL INTERFERENCE Ph.D. Thesis
Ellis Raymond Shamash 1973 176 p
Avail: Univ. Microfilms Order No. 74-11572

High speed digital communication often limited by intersymbol interference is presented. Linear, nonlinear and adaptive communication systems are studied. Linear systems are considered under the criterion of bit error probability. A procedure for the computation of bit error probability is presented. Bit error probability for nonlinear receivers are considered. Dissert. Abstr.

N74-25662 Polytechnic Inst. of Brooklyn, N.Y.
MULTIDIMENSIONAL STATISTICAL COMMUNICATION THEORY Ph.D. Thesis
Dennis Thomas Mangano 1972 448 p
Avail: Univ. Microfilms Order No. 72-28259

The study of information transmission through energy propagating media with both spatial and temporal characteristics is undertaken for the purpose of both understanding and exploiting the spatial-temporal nature of the problem. Basic to this undertaking is the modelling and subsequent incorporation of the role of the propagation process in the general detection, estimation, and information theory problems. The eventual solution of these general statistical communication theory problems and specific supporting examples leads to canonical forms for the optimum detectors, and information - theoretic functions. The general problems involve determining the existence or characteristics of a spatially-temporally distributed source, located in a bounded, energy-transmitting medium, based on knowledge of the spatial, temporal distribution of energy in some other volume of the medium. In addition to this source of energy, volumic, boundary, and self-noise contributions are also assumed to exist. Dissert. Abstr.

N74-25663 New Mexico State Univ., Las Cruces.
PHASE-LOCK LOOP CHARACTERISTICS IN THE PRESENCE OF NON-WHITE NOISE FOR BAND-PASS TYPES OF MODULATING SPECTRA Ph.D. Thesis
Robert Richard Henry 1974 100 p
Avail: Univ. Microfilms Order No. 74-11363

Analytical techniques are presented to determine and optimize phase-lock loop characteristics. An improved model (called the Quasi-Linear Model) is developed which takes into account small bandwidths and the non-linear effects associated with large phase errors. Results predicted by the Quasi-Linear Model for a second-order are compared to experimental results to determine the accuracy of the model. Theoretical and experimental results are used to draw conclusions concerning threshold, multiplier output variance, phase error variance, output signal-to-noise ratio, and signal distortion. Dissert. Abstr.

N74-25664 Illinois Univ., Urbana.
HIGH-FREQUENCY BACKSCATTERING FROM AN AIRBORNE TARGET Ph.D. Thesis
Chi-Fa Antony Chuang 1973 146 p
Avail: Univ. Microfilms Order No. 74-11982

The electromagnetic radar scattering parameters for a complex airborne target at high frequencies were studied. Components of the target are modeled by simple geometrical shapes, which include ellipsoids, elliptical plates, and semiinfinite cylinders with proper terminations located a finite distance from the opening end. The backscattered fields from ellipsoids, elliptical plates, and semiinfinite elliptical cylinders are derived by using ray-optical methods. Backscattered fields from the semi-infinite cylinder with terminations are obtained by employing the Wiener-Hopf techniques and generalized scattering matrix method. These backscattered fields from individual components are subsequently combined in a consistent manner that takes into consideration the geometrical phase delay and shadowing effect, thus yielding the total scattered field from the target. Theoretical computations are compared with experimental data measured by a nanosecond short pulsed radar for a T-33 aircraft and agreement is reasonably good. Dissert. Abstr.

N74-25665 British Broadcasting Corp., Kingswood (England). Research Dept.
SATELLITE BROADCASTING: CHANNEL SEPARATION REQUIREMENTS FOR FM TELEVISION SIGNALS
N. H. C. Gilchrist Apr. 1974 8 p refs
(BBC-RD-1974/20) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A practical investigation was conducted in order to determine the frequency separation required between FM television signals, both with and without a sound subcarrier, so that mutual interference is avoided. The investigation was concerned primarily with interference between PAL color television signals, but brief tests were conducted to determine the requirements if PAL and SECAM signals were to occupy adjacent channels. It was found that a satellite broadcasting system based on EBU recommendations, with a receiver bandwidth of 27-5 MHz, requires a separation of at least 29-5 MHz between adjacent channels. Author

N74-25666 British Broadcasting Corp., Kingswood (England). Research Dept.
SATELLITE BROADCASTING: CHANNEL SEPARATION REQUIREMENTS FOR FM SOUND SIGNALS AND FOR A FM SOUND SIGNAL ADJACENT TO A FM TELEVISION SIGNAL
N. H. C. Gilchrist Apr. 1974 8 p refs
(BBC-RD-1974/21) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Experimental work is described which was carried out to determine the frequency separation required between high-deviation FM sound signals, and between FM sound and FM television signals, when they are transmitted on adjacent channels. A frequency separation of 0.8 MHz is recommended for situations where two FM sound services occupy adjacent channels and, where sound and television services occupy alternate channels, a separation of 15 MHz is recommended. The separation required between television signals with sound accompaniment on a separate carrier is also covered and compared with the requirements for television signals which incorporate the accompanying sound signal on a subcarrier. In these cases, the separations recommended are 30 MHz and 29.5 MHz, respectively. Author

N74-25667 British Broadcasting Corp., Kingswood (England). Research Dept.
UHF RELAY STATIONS: LOG-PERIODIC TRANSMITTING AERIAL FOR OGMORE VALE
G. H. Millard May 1974 12 p refs
(BBC-RD-1974/22) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

An experimental low power vertically-polarized transmitting aerial which comprises a stack of four log-periodic aerials is described. Factors affecting the utility of the aerial compared with other types are discussed. Author

N74-25668 Tennessee Univ., Knoxville.
CIRCULAR SCAN SYNTHETIC APERTURE RADAR Ph.D. Thesis
Harold Irvin Brock 1973 148 p
Avail: Univ. Microfilms Order No. 74-11233

Terrain imaging obtained, by using a microwave radar mounted upon a spinning vehicle is studied. The resolution necessary to produce accurate radar maps is obtained without the need for a large bulky antenna. This method, which is called circular scan synthetic aperture radar, is similar to linear synthetic aperture radar (SAR). A brief review of the side-looking SAR principle is given and the optimum resolutions are derived. The circular scan SAR case is presented. The impulse response of the system is determined, and the equations for the optimum resolution are derived. The effects of phase errors are also included. The return signal is sinusoidal frequency modulated, and the matched filter response for this signal is derived. The problem of imaging a distributed target is studied, and the limitations upon obtaining an image are stated. The effects of the spatial frequencies of the target upon the resolution and the sampling rate are identified. Dissert. Abstr.

N74-25669 California Univ., Los Angeles.
DIFFERENTIAL SCATTERING OF ELECTROMAGNETIC WAVES BY HOMOGENEOUS ISOTOPIC DIELECTRIC BODIES Ph.D. Thesis
Peter William Barber 1973 177 p
Avail: Univ. Microfilms Order No. 74-11493

Scattering of electromagnetic waves by dielectric bodies is described. The differential scattering characteristics of closed three dimensional bodies have been analyzed to determine their dependence on the size, shape and dielectric constant of the scattering object. Potential applications to the study of small particles by light scattering measurements have been investigated. Computer programs have been developed to numerically solve the scattering problem for three cases. These computer programs, although not discussed in detail in the dissertation, are throughly documented in a referenced report. Differential scattering curves have been computed for spheres, prolate and oblate spheroids, rods and ellipsoids. The computed results have been analyzed to determine the dependence of the differential scattering upon the size, shape and dielectric constant of the scattering object. Dissert. Abstr.

N74-25670*# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
SPACEBORNE SYNTHETIC APERTURE RADAR PILOT STUDY Final Report
11 Apr. 1974 409 p
(Contract NAS5-21951)
(NASA-CR-139004) Avail: NTIS HC $23.50 CSCL 17I

A pilot study of a spaceborne sidelooking radar is summarized. The results of the system trade studies are given along with the electrical parameters for the proposed subsystems. The mechanical aspects, packaging, thermal control and dynamics of the proposed design are presented. Details of the data processor are given. A system is described that allows the data from a pass over the U. S. to be in hard copy form within two hours. Also included are the proposed schedule, work breakdown structure, and cost estimate. Author

N74-25671# National Bureau of Standards, Washington, D.C.
DATA COMMUNICATIONS SYSTEM THROUGHPUT PERFORMANCE USING HIGH SPEED TERMINALS ON THE DIAL TELEPHONE NETWORK
Dana S. Grubb May 1973 42 p refs
(NBS-TN-779) Avail: SOD HC $0.65 Domestic Postpaid or $0.45 GPO Bookstore as C13.46:779

Throughput performance of high speed data terminals using the dial telephone network is calculated for signaling rate of 1200 to 4800 bits per second using the ANSI control procedures and measured in terms of the proposed ANSI strand TRIB (Transfer Rate of Information Bits). The performance calculations are shown graphically with TRIB as a function of block length, error rates of the telephone connection, signaling rate and telephone line delays. Error rates are based on a published survey involving several hundred telephone connections to geographically distributed parts of the United States. Author

N74-25672*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH-TEMPERATURE DIELECTRIC PROPERTIES OF CANDIDATE SPACE SHUTTLE THERMAL PROTECTION SYSTEM AND ANTENNA WINDOW MATERIALS
Melvin C. Gilreath and Stark L. Castellow, Jr. Washington Jun. 1974 55 p refs
(NASA-TN-D-7523; L-9323) Avail: NTIS HC $3.75 CSCL 17B

An experimental program was conducted to measure the dielectric properties of several candidate space shuttle, antenna window and thermal protection system (TPS) materials from ambient to approximately 1473 K. The results obtained during this measurement program are presented. The high temperature measurement technique is described. Several problem areas associated with the low density reusable surface insulation (RSI) materials are discussed. The dielectric properties as a function of temperature of temperature of other dielectric materials being considered for possible space-shuttle applications are also presented. Author

N74-25673*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHANNEL SIMULATION FOR DIRECT-DETECTION OPTICAL COMMUNICATION SYSTEMS
M. Tycz and M. W. Fitzmaurice Washington May 1974 20 p refs
(NASA-TN-D-7641; G-7439) Avail: NTIS HC $3.00 CSCL 17B

A technique is described for simulating the random modulation imposed by atmospheric scintillation and transmitter pointing jitter on a direct-detection optical communication system. The system is capable of providing signal fading statistics which obey log-normal, beta, Rayleigh, Ricean, or chi-square density functions. Experimental tests of the performance of the channel simulator are presented. Author

N74-25674*# Ohio State Univ., Columbus. ElectroScience Lab.
SATELLITE TO AIRCRAFT MULTIPATH SIGNALS OVER THE OCEAN Final Report
W. H. Peake May 1974 46 p refs
(Grant NGR-36-008-169)
(NASA-CR-138578; ESL-3266-2) Avail: NTIS HC $5.50 CSCL 17B

A satellite-to-aircraft communication link over the ocean may include a specularly reflected signal and a diffusely scattered signal, as well as the direct path transmission. A computer program is provided for estimating two statistical properties of the diffuse signal, namely the Doppler spectrum and the delay spectrum. A convenient representation of the total signal is also provided. Examples of the Doppler and delay spectra for a number of representative link geometries are given to illustrate the features of the diffuse signal. Author

N74-25675# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN ITERATIVE METHOD FOR THE SYNTHESIS OF REFLECTOR ARRAYS
A. F. Chaplin and V. F. Makkaveeva Mar. 1973 16 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 15, no. 1, 1972 p 29-37
(NTC-74-11937) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The problem of synthesizing a reflector array whose geometry is fixed by a given directional pattern is examined in the mean square approximation. An iterative method, whose convergence is guaranteed for small mutual coupling between the lattice elements, is presented for the solution of the system of equations. A choice of values for the reactive tuned resistances is obtained which guarantees that the directivity pattern obtained will have the smallest mean square deviation from the required pattern. Calculations for dipole arrays numbering up to 40 are shown. Author

N74-25676# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIFFRACTION OF A PLANE ELECTROMAGNETIC WAVE BY A CORRUGATED DIELECTRIC SURFACE
O. S. Mergelyan Mar. 1973 9 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (Gorkiy), v. 15, no. 8, 1972 p 1233-1238
(NTC-74-11926; Rept-73-70) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The problem of the diffraction from a corrugated dielectric surface is investigated in the perturbation theory approximation. Expressions have been derived for the amplitude and angular distribution of the scattered fields. Author

N74-25677# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONDITIONS ON A LINE-FED ANTENNA FOR THE PRODUCTION OF SEVERAL INDEPENDENT BEAMS
R. Reitzig May 1973 19 p refs Transl. into ENGLISH from Frequenz (West Berlin), v. 26, no. 4, 1972 p 93-99
(NTC-74-11946; Rept-73-127) Avail: NTIS HC $4.00, National Translations Center, John Crerar Library, Chicago, Ill. 60616

The conditions are derived for simultaneous and independent multibeam-excitation at a single frequency and polarization. It is shown that there is a close relationship between these conditions and the efficiency of the antenna system. It is greatest when all line branches are decoupled and the radiation patterns are orthogonal, in a mathematical sense, in the radiation space. Author

N74-25678# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RECEIVING CHARACTERISTICS OF ANTENNAS FOR COHERENT AND INCOHERENT RADIATION
G. Feix Mar. 1973 9 p refs Transl. into ENGLISH from NTZ - Nachr. Tech. Z. (Brunswick), v. 25, no. 11, 1972 p 520-522
(NTC-74-11861; Rept-73-110) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A Fourier transform to describe the antenna characteristics of high resolution antennas used in determining the intensity distribution of a cosmic transmitting source is developed. A mathematical model is developed to expressed the relation between the far field characteristic and the aperture distribution. Diagrams are provided to show the antenna characteristics in a Fourier notation and for a Gaussian illumination of the aperture. Author

N74-25679*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VARIABLE-BEAMWIDTH MONOPULSE ANTENNAS
R. F. Schmidt Mar. 1974 95 p refs
(NASA-TM-X-70650; X-811-74-62) Avail: NTIS HC $7.75 CSCL 17B

The merits of nine methods for zooming microwave amplitude-sensing monopulse antenna patterns are discussed. Of these, six are directly related to the TDRSS (Tracking Data Relay Satellite System) and are compatible with a deployable-mesh pseudo-paraboloidal main reflector. The remaining three methods utilize radically different geometrical configurations that depart considerably from the TDRSS parameters existing at this time. Preservation of the monopulse postulates is considered to be of prime importance for any variable-beamwidth candidate, however, it is allowed that approximate satisfaction of the postulates should be accepted for practical reasons. All of the methods discussed admit free choice of the polarization state, and the zooming function is never predicated on polarization. Exploration of the zooming techniques was carried out almost entirely by means of the Kirchhoff-Kottler vector diffraction program. The program generates electric and magnetic field intensity, associated phase, and time-average Poynting vector power flow in the intermediate near-field and far-field zones in both receive and transmit modes of operation. A few of the concepts have been verified experimentally with excellent agreement between theory and practice. Author

N74-25680*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APERTURE EXCITED DIELECTRIC ANTENNAS
W. F. Crosswell, J. S. Chatterjee, V. B. Mason (Michigan Univ., Ann Arbor), and C. T. Tai (Michigan Univ., Ann Arbor) Washington

May 1974 128 p refs
(NASA-TN-D-7342; L-8920) Avail: NTIS HC $4.75 CSCL 17B

The results of a comprehensive experimental and theoretical study of the effect of placing dielectric objects over the aperture of waveguide antennas are presented. Experimental measurements of the radiation patterns, gain, impedance, near-field amplitude, and pattern and impedance coupling between pairs of antennas are given for various Plexiglas shapes, including the sphere and the cube, excited by rectangular, circular, and square waveguide feed apertures. The waveguide excitation of a dielectric sphere is modeled using the Huygens' source, and expressions for the resulting electric fields, directivity, and efficiency are derived. Calculations using this model show good overall agreement with experimental patterns and directivity measurements. The waveguide under an infinite dielectric slab is used as an impedance model. Calculations using this model agree qualitatively with the measured impedance data. It is concluded that dielectric loaded antennas such as the waveguide excited sphere, cube, or sphere-cylinder can produce directivities in excess of that obtained by a uniformly illuminated aperture of the same cross section, particularly for dielectric objects with dimensions of 2 wavelengths or less. It is also shown that for certain configurations coupling between two antennas of this type is less than that for the same antennas without dielectric loading. Author

N74-25681# Army Foreign Science and Technology Center, Charlottesville, Va.
IMPROVED RADIO COMMUNICATION
E. Danilov and N. Shaiunov 6 Nov. 1974 4 p Transl. into ENGLISH of unidentified Russian language article
(AD-776561; FSTC-HT-23-2466-72) Avail: NTIS CSCL 17/2

The paper describes a vertical telescopic dipole antenna for high frequency radio communications. GRA

N74-25682# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
EFFECTS OF THE PUMP SYMMETRY ON THE PARAMETRIC EXCITATION OF TRANSVERSE AND LONGITUDINAL WAVES
Nguyen The Hung May 1974 11 p refs
(LRP-81/74) Avail: NTIS HC $4.00

The parametric coupling of transverse and longitudinal waves in a plasma is shown to depend strongly on the structure of the pump wave. Within the fluid model, the threshold pump intensity and the maximum growth rate of the excited waves are obtained for the cases of a linearly polarized, a travelling, and a standing circularly polarized pump wave. Author

N74-25683# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE SHIELDED STRIP TRANSMISSION LINE WITH TWO INNER CONDUCTORS OF DIFFERENT WIDTH
H. Groll and H. Koffler Jun. 1973 16 p refs Transl. into ENGLISH from NTZ-Nachrtech. Z. (Brunswick), v. 21, no. 7, 1968 p 384-388
(NTC-11929; Rept-73-146) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The characteristics and applications of a shielded strip transmission line with two inner conductors of different width are discussed. The effects of inaccurate manufacture on the performance of the transmission lines are explained. The dependence of the characteristic impedance on the air gap for different width ratios is shown in graph form. The test equipment and procedures for determining the characteristic impedance and performance of strip transmission lines are described. Mathematical models are developed to show the relationship of the electrical parameters. Author

N74-25684# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EXPERIMENTAL INVESTIGATION OF THE PROPAGATION OF SUBMILLIMETER-BAND WAVES IN A WAVEGUIDE FILLED WITH n-InSb IN A MAGNETIC FIELD
Yu. G. Altschuler, L. I. Katz et al Mar. 1973 13 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (USSR), v. 15, no. 8, 1972 p 938-944
(NTC-74-11942; Rept-73-85) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Results obtained in an investigation of the propagation of millimeter-band electromagnetic waves through a waveguide with a wafer of indium antimonide placed in a constant magnetic field are presented. The results of measurements made with various orientations of the magnetic field show the effectivity of their action on the amplitude and the phase of the propagating microwave signal. It was shown that it is possible to construct various types of controlling devices (attenuators, phase rotators, gyrators) for millimeter-band waves. Author

N74-25685# IIT Research Inst., Chicago, Ill.
EMP RESPONSE OF PARABOLIC REFLECTOR ANTENNAS Final Report
P. P. Toulios Dec. 1973 140 p refs
(Contract DAAG39-73-C-0189; DNA Proj. NWET-R99QAXE)
(AD-776399; IITRI-E6276) Avail: NTIS CSCL 09/5

A theoretical investigation was conducted to approximately determine the electromagnetic pulse (EMP) response of Satellite Communications Antenna Systems (SATCOM). The ultimate objective is to be able to estimate system susceptibility to an EMP environment. GRA

N74-25686# Marconi Space and Defence Systems Ltd., Camberley (England).
A STUDY OF MICROWAVE COMMUNICATIONS FOR SCIENTIFIC SATELLITES. ANNEX 1: SURVEY OF MICROWAVE PROPAGATION IN THE 12 - 18 GHz RANGE WITH PARTICULAR REFERENCE TO SATELLITE COMMUNICATION
A. J. Bayliss, J. W. Carter, and D. Maccoll Paris ESRO Dec. 1973 121 p refs
(Contract ESTEC-924/70)
(ESRO-CR-204) Avail: NTIS HC $9.25

Available information on the propagation of microwaves in the 12 - 18 GHz band, over slantpaths through the atmosphere, was studied. Attenuation, noise, refraction, and scintillation were examined, together with various methods of measuring them. An experimental program that would yield useful, practical attenuation and noise figures in an acceptable time is recommended. It is concluded that the best method of measuring signal degradation is by direct recording of a signal radiated from a geostationary satellite, but it is unlikely that any serious measurements could be started until the SIRIO satellite becomes operational. Two other attractive methods of measurement already in use in England and elsewhere could readily be implemented by ESTEC: sky noise temperature measurement and sun tracking using radiometric methods. If useful attenuation and noise data are required say one year from now, a series of sky noise temperature measurements should be implemented around 12 or 13 GHz. If it is essential to consider higher frequencies than this for future European satellite systems, these measurements should be supplemented or replaced by others based on the sun tracking technique. Author (ESRO)

N74-25687# Osservatorio Astrofisico di Arcetri, Florence (Italy).
SOLAR RADIO EMISSION: OUTSTANDING EVENTS AT 9285, 2830 AND 1420 MHz Annual report, Jan. - Dec. 1970
[1973] 49 p
(Fasc-101) Avail: NTIS HC $5.50

Solar radio burst measurements were tabulated using a Dicke radiometer. The different shapes of a recorded bursts are discussed. ESRO

N74-25688# Osservatorio Astrofisico di Arcetri, Florence (Italy).
SOLAR RADIO EMISSION: OUTSTANDING EVENTS AT 9285, 2830 AND 1420 MHz Annual report, Jan. - Dec. 1971
[1973] 29 p
(Fasc-103) Avail: NTIS HC $4.50

For abstract see N74-25687.

N74-25689# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
COMPARISON OF THE COEFFICIENT, AMPLITUDE AND PHASE SPECTRA OF SOFT AND HARDWARE DEVELOPMENTS OF THE COS-SIN, WALSH, HAAR, EXPONENTIAL, KRONECKER AND LAGUERRE FUNCTIONS IN VIEW OF

SPEECH ANALYSIS AND PERCEPTION [VERGLEICH DER KOEFFIZIENTEN-, AMPLITUDENUND PHASENSPEKTREN DER COS-SIN-, WALSH-, HAAR-, EXPONENTIAL-, KRONECKER- UND LAGUERRE-ENTWICKLUNGEN AUF DER SOFT- UND HARDWARESEITE, IM HINBLICK AUF SPRACHANALYSE UND SPRACHERKENNUNG]
Juergen Kuehlwetter 1972 32 p refs In GERMAN
(IND-FB-25) Avail: NTIS HC $4.75

Cosine, sine, Walsh, Haar, exponential, Kronecker, and Laguerre expansions were applied on time and amplitude quantized, basic, periodic, synchronously sequented, and spline interpolated speech stored in a computer core. The coefficient spectra obtained were divided into amplitude and phase spectra. Comparision criteria used were the computation time of amplitude coefficients, coefficient spectra, cyclic basic periodic synchronous segmentation shift invariance, and hardware realization. ESRO

N74-25690# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
ADAPTIVE DETERMINATION OF MAXIMA AND MINIMA OF THE COS-SIN AMPLITUDE SPECTRUM ENVELOPE CURVE [ADAPTIVE BESTIMMUNG DER MAXIMA UND MINIMA DER HUELLKURVE DES COS-SIN-AMPLITUDENSPEKTRUMS]
Juergen Kuehlwetter 1972 9 p refs In GERMAN
(IND-FB-33) Avail: NTIS HC $4.00

The determination of the maxima and minima of the envelope curve of the cosine and sine amplitude spectra of speech in real time is not possible in software. In order to carry out maxima-minima determinations special hardware computers must be used. One such computer is described. No more than six basic periods which have no effect on the speech recognition process or speech analysis are lost in the analysis. ESRO

N74-25691# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
VOWEL PERCEPTION INDEPENDENT OF SPEAKER [SPRECHERUNABHAENGIGE VOKALERKENNUNG]
Juergen Kuehlwetter 1972 16 p refs In GERMAN
(IND-FB-36) Avail: NTIS HC $4.00

The recognition of vowels in the amplitude range was studied, as the recognition of vowels in the frequency range by the formant frequencies F1, F2, and F3 is not unambiguous for all speakers. For vowel recognition the amplitudes of the formants F1, F2, F3 and the antiformant AF1 were used. ESRO

N74-25692# Technische Hochschule, Darmstadt (West Germany). Abteilung Elektronische Schaltungen.
INVESTIGATION AND COMPARISON OF METHODS FOR SPEECH FUNDAMENTAL FREQUENCY PERCEPTION [UNTERSUCHUNG UND VERGLEICH VON VERFAHREN ZUR ERKENNUNG DER SPRACHGRUNDFREQUENZ]
Hans Joachim Erb Jun. 1972 42 p refs In GERMAN
(IND-FB-41) Avail: NTIS HC $5.25

Several methods for recognition of the fundamental frequency of speech are described, and the possibility of their application to real time fundamental frequency recognition is investigated. Proposals for the hardware realization of a speech fundamental frequency analyzer are outlined. ESRO

N74-25693# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
LOEVE-KARHUNEN TRANSFORMATION AND ITS APPLICATION TO REDUNDANCY REDUCTION IN COMMUNICATION ENGINEERING [DIE LOEVE-KARHUNEN TRANSFORMATION UND IHRE VERWENDUNG FUER DIE NACHRICHTENTECHNIK ZUR REDUNDANZREDUKTION]
Karl Heinz Georgi Oct. 1972 30 p refs In GERMAN
(IND-FB-44) Avail: NTIS HC $4.50

It is shown how the Loeve-Karhunen integral transformation can be calculated as a discrete matrix transformation and how this transformation can be applied to Shannon's information theory. The principles of probability theory are discussed, leading to certain formulas which are generally applied. Shannon's statistical information theory is introduced, and relations between the theories, leading to the Loeve-Karhunen transformation, are pointed out. ESRO

N74-25694# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
SUITABILITY INVESTIGATION OF DIGITAL FILTERS FOR THE REALIZATION OF A SPEECH SYNTHESIZER [UNTERSUCHUNG DER EIGNUN VON DIGITALEN FILTERN FUER DIE REALISIERUNG EINES SPRACHSYNTHETISATORS]
Arild Lacroix Dec. 1972 12 p refs In GERMAN
(IND-FB-46) Avail: NTIS HC $4.00

A discussion of the advantages and disadvantages of digital speech synthesizers compared with analog synthesizers shows that the realization of a speech synthesizer as a digital filter makes sense. The cascade structure for the realization of the canonic structure of digital filters is found to be advantageous in realizing a speech synthesizer. ESRO

N74-25695# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
PROGRAMMABLE EXCITATION GENERATOR FOR A DIGITAL SPEECH SYNTHESIZER [PROGRAMMIERBARER ANREGUNGSGENERATOR FUER EINEN DIGITALEN SPRACHSYNTHETISATOR]
Werner Auth Dec. 1972 9 p refs In GERMAN
(IND-FB-47) Avail: NTIS HC $4.00

An excitation generator for synthetic speech, realizable in digital form, is described. The form of the excitation pulses for voiced sounds is programmable. For the production of voiced rasping sounds, these pulses are multiplied with noise. ESRO

N74-25696# Technische Hochschule, Darmstadt (West Germany). Abteilung Elektronische Schaltungen.
REAL TIME ANALOG DETERMINATION OF THE COEFFICIENTS OF THE AMPLITUDE SPECTRUM OF SPEECH SIGNALS SYNCHRONDUS TO FUNDAMENTAL PERIODS [GRUNDPERIODENSYNCHRONE ANALOGE BESTIMMUNG DER FREQUENZEN UND AMPLITUDEN DER KOEFFIZIENTEN DES AMPLITUDENSPEKTRUMS VON SPRACHSIGNALEN IN ECHTZEIT]
Juergen Kuehlwetter Feb. 1973 16 p refs In GERMAN
Sponsored by Deut. Forschungsgemeinschaft
(IND-FB-49) Avail: NTIS HC $4.00

It is shown that the amplitude spectrum of speech signals is only approximated by real time analysis with a third filter cascade. The multiplication of the frequencies of partial speech signal oscillations leads to constant frequencies of the partial oscillations, independent of the fundamental frequency. The amplitudes and frequencies of the transformed speech signal can then be determined in real time by means of a cascade of identical bandpass filters with constant middle frequency. ESRO

N74-25697# Technische Hochschule, Darmstadt (West Germany). Abteilung Elektronische Schaltungen.
PERCEPTION OF VOWELS AND SIMILAR SOUNDS IN VIEW OF WORK RECOGNITION IN REAL TIME [ERKENNUNG VON VOKALEN UND VOKALAEHNLICHEN LAUTEN IM HINBLICK AUF EINE WORTERKENNUNG IN ECHTZEIT]
Juergen Kuehlwetter Feb. 1973 18 p refs In GERMAN
Sponsored by Deut. Forschungsgemeinschaft
(IND-FB-50) Avail: NTIS HC $4.00

A concept is described for the recognition of vowels, similar younds, and, the separate phoneme groups. The recognition criteria is based on the frequencies and amplitudes of the first maxima and minima of the amplitude spectrum, which is determined by hardware analysis in real time, and derived from the maximum amplitude of the time signal per fundamental period. ESRO

N74-25698# Technische Hochschule, Darmstadt (West Germany). Abteilung Elektronische Schaltungen.
DECREASE OF MEASURING ERROR OF A SPEECH FUNDAMENTAL FREQUENCY ANALYZER ACCORDING TO THE INTEGRATOR CHAIN PRINCIPLE [VERRINGERUNG DES MESSFEHLERS EINES SPRACHGRUNDFREQUENZANALYSATORS NACH DEM PRINZIP EINER INTEGRATORKETTE]
Hans Joachim Erb May 1973 14 p refs In GERMAN Sponsored by Deut. For schungsgemeinschaft
(IND-FB-54) Avail: NTIS HC $4.00

It is shown that the requirements of a constant group delay and small transient overshoot are not compatible with each other for an integrator chain. An extended arrangement is described in which a controllable high pass filter has been placed before the integrator chain, and it is shown that the measurement error resulting from the group delay lies below the permissible error limit of 1 % and that the overshoot phenomena do not interfere. ESRO

N74-25699# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
SIGNAL ANALYSIS AND SYNTHESIS USING LAGUERRE FUNCTIONS [SIGNALANALYSE UND -SYNTHESE MIT LAGUERREFUNKTIONEN]
Harald Dornauf and Karl Heinz Georgi Feb. 1973 15 p refs In GERMAN
(IND-FB-56) Avail: NTIS HC $4.00

The theory and realization of a transmission system with Laguerre functions is described, with special reference to the transmission of speech. Signals can be described as sums of step responses, in which only limited sums, i.e. a limited quality, can be used. The derivations are based on convolution, as in linear time-invariant networks, which simplifies hardware realization. A hardware realization for the Laguerre analysis and synthesis in which all pass networks have been realized by using operational amplifiers is proposed. ESRO

N74-25700# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
DESCRIPTION OF SIGNALS AND SYSTEMS BY MOMENTS [DIE BESCHREIBUNG VON SIGNALEN UND SYSTEMEN DURCH MOMENTE]
Guenter Morgenstern Jun. 1973 21 p refs In GERMAN
(IND-FB-58) Avail: NTIS HC $4.25

Some relations on the moments of the convolution products of time function are indicated and applied to the description of linear systems by moments. These relations are represented in the form of matrix operations, by defining the moment matrix of a signal for this purpose. It is shown that the first nine moments of the output function of a linear, time-invariant fourpole can be calculated by means of a generalized convolution of the first nine moments of the input function with the pulse response of the fourpole. ESRO

N74-25701# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
FINITE SYSTEM THEORY [FINITE SYSTEMTHEORIE]
Wilhelm Klein Feb. 1974 110 p refs In GERMAN
(IND-FB-65) Avail: NTIS HC $8.50

The finite system theory deals with time-discrete periodic signals in pulse transmission systems, allowing a treatment with finite matrices of cyclic form, or finite series. The methods of classical system theory (Fourier transformation, Laplace transformation, Z transformation) are boundary cases of the finite system theory. ESRO

N74-25702# Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.
COUPLING IN MULTI-BEAM REFLECTOR ANTENNAS Final Report
J. BachAndersen, H. A. Lessow, and H. Schjaer-Jacobsen Aug. 1973 126 p refs
(Contract ESTEC-1698/72-AA)
(R-119; ESRO-CR(P)-404) Avail: NTIS HC $9.50

A study on the coupling effects in reflector type multibeam antennas and the influence on gain and polarization properties was carried out. Feed antennas were crossed-dipoles and the more general class of minimum scattering antennas. Coupling effects in the feed cluster, directly between feeds and also via the reflector, were treated using relevant numerical methods. Relevance to air traffic control is demonstrated by contoured coverage of specific areas on earth from a synchronous orbit satellite. Author (ESRO)

N74-25703# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
PROPAGATION AND RADIATION PROPERTIES OF ELLIPTICAL WAVEGUIDE WITH ANISOTROPIC BOUNDARY. PART 1: THEORY AND EXPERIMENTS
J. K. M. Jansen and M. E. J. Jeuken 20 Oct. 1973 139 p refs
(Contract ESTEC-1657/72-HP)
(ESRO-CR(P)-407) Avail: NTIS HC $10.00

A feasibility study to obtain an elliptical beam with circular polarization in every point of space, using a corrugated elliptical waveguide horn antenna, is presented. The components of the electromagnetic field is such a waveguide were expressed as series in Mathieu functions and the dispersion equation was derived. Two types of solutions are possible. The corresponding modes have in pair the same cutoff frequency and propagation constant. The modes are of the hybrid type. If the transverse modes act as the aperture field, the radiation patterns of modes having the same cutoff frequency are identical. Exactly circularly polarized fields are obtained by superposition of corresponding even and odd modes with 90 deg phase shift. The computation of the radiation pattern of the elliptical waveguide radiator with anisotropic boundary shows that the pattern is asymmetric. Theory is supported by experimental tests with various types of corrugated antennas, provided the antenna aperture is not small in relation to the wavelength. Author (ESRO)

N74-25704# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
PROPAGATION AND RADIATION PROPERTIES OF ELLIPTICAL WAVEGUIDE WITH ANISOTROPIC BOUNDARY. PART 2: COMPUTER PROGRAMS
J. K. M. Jansen and M. E. J. Jeuken 20 Oct. 1973 39 p
(Contract ESTEC-1657/72-HP)
(ESRO-CR(P)-408) Avail: NTIS HC $5.00

Computer programs used in the calculation of Mathieu functions needed for the radiation pattern of a corrugated horn antenna of elliptical section are listed. The Mathieu functions are given in a series of Bessel functions. The Bessel functions were computed using a variant of the backward recurrence algorithm of Miller. In this algorithm the gamma function has to be computed with the algorithm by Wynn. Author (ESRO)

N74-25705# Physics Lab. RVO-TNO, The Hague (Netherlands).
ANALYSIS OF AN IRIS-LOADED INFINITE PLANAR PHASED-ARRAY ANTENNA OF RECTANGULAR WAVEGUIDES
H. J. VanSchaik and A. M. H. VanSpengen Jan. 1974 54 p refs
(PhL-1974-03; TDCK-63933) Avail: NTIS HC $5.75

The reflection factor of an iris-loaded infinite phased-array antenna consisting of rectangular waveguides was calculated. Expressions were derived for the tangential components of the electromagnetic field vectors in the various domains. The analysis is based upon the expansion of the tangential electric aperture field in terms of a complete set of judiciously chosen functions. A matching procedure leads to an infinite set of algebraic equations in which the expansion coefficients of the aperture field occur as unknowns. The relevant system is solved numerically employing a judicious truncation. From the numerical results it can be concluded that the presence of an iris only does not necessarily lead to a remarkable improvement. Author (ESRO)

N74-25706# Physics Lab. RVO-TNO, The Hague (Netherlands).
A STUDY OF THE BLIND SCAN ANGLE EFFECT IN A PLANAR PHASED ARRAY ANTENNA WITH TRIANGULAR LATTICE
J. Snieder Feb. 1974 38 p refs
(PhL-1974-04; TDCK-64145) Avail: NTIS HC $5.00

The blind scan angle effect, which can seriously degrade the performance of a planar phased array antenna, was studied experimentally with 2 sizes of arrays in the X-band. The scan volume, where the degradation occurs, was estimated. In this volume a maximum attenuation of 30 db was found. A distinction was made between this effect and that due to the grating lobe. Good agreement was obtained with a theoretical calculation of this blind scan angle effect. Author (ESRO)

N74-25707# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
LATERAL SUPPRESSION AND LOUDNESS REDUCTION OF A TONE IN NOISE
T. Houtgast 1974 26 p refs

(IZF-1973-15; TDCK-63151) Avail: NTIS HC $4.50

Several masking experiments were performed with a 1000-Hz test tone and a masker consisting of a 1000-Hz tone plus noise. In two experiments using a non-simultaneous masking technique (e.g., forward masking), it was found that a tone-plus-noise masker may be considerably less effective in masking than the tonal masker alone. This effect of noise on the masking effectiveness of a tone appeared to correspond quantitatively with the effect of noise on the loudness of the tone. It is suggested that these noise-induced reductions of both the loudness and the masking effectiveness of a tone reflect the operation of one and the same mechanism: lateral suppression of the tone by the noise. The results of further experiments with bands of noise added to the 1000-Hz tone illustrate that the supposed suppression acts mainly one-directional: from higher to lower frequencies. Author (ESRO)

N74-25708# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

SPEECH TRANSMISSION BY RADIO EQUIPMENT 2 [SPRAAKOVERDRACHT VIA RADIO-APPARATUUR II]

T. Houtgast and H. J. M. Steeneken 1973 21 p In DUTCH; ENGLISH summary

(Contract A71/KL/023)

(IZF-1973-16; TDCK-63150) Avail: NTIS HC $4.25

The consequences of three types of signal processing for speech intelligbility in radio communication were investigated; automatic gain control (AGC), peak clipping, and band-pass limiting. In all cases, the 1%-peak level of the processed speech signal was matched to that of the unprocessed speech, and the effect of the addition of interfering noise was investigated with intelligibility tests. It appeared that, for AGC, and attack and decay time of the order of 0.5 sec is most preferable. With respect to peak clipping, the most favorable clipping level is about 10-15 db below the 1%-peak level of the speech signal. Speech filtering decreases its resistance against interfering noise, but this should be considered in connection with a possible decrease of the transmission noise, depending on the modulation system used. Author (ESRO)

N74-25709# European Space Research Organization, Paris (France).

SHORT HELICAL ANTENNAS WITH EXACT CIRCULAR POLARIZATION BEHAVIOUR BY CONDUCTING DISK AT THE END OF THE HELIX

H. Bothe Apr. 1974 98 p refs Transl. into ENGLISH of Kurze Wendelantennen mit Exakt Zirkularem Polarisationsverhalten durch eine Leitscheibe am Wendelende, DLR-FB-73-46, DFVLR, 5 Feb. 1973

(ESRO-TT-41; DLR-FB-73-46) Avail: NTIS HC $8.00; DFVLR, Porz, West Ger. 18 DM

The polarization behavior of axial mode short helical antennas with a number of turns smaller than two was investigated through theory and experiment. Exact circular polarization was achieved by arranging a conducting disc at the free end of the helix. The influence of the disc on polarization was demonstrated by measuring the current distribution on the helix conductor, calculating the resulting polarization behavior, and measuring the far field polarization. Author (ESRO)

N74-25710# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

TIME DEPENDENT INTERNAL ELECTROMAGNETIC PULSE FOR SPHERICAL AND CYLINDRICAL SYMMETRY M.S. Thesis

Theodore C. Salvi Mar. 1974 51 p refs

(AD-775708; GEP/PH/74M-10) Avail: NTIS CSCL 20/14

Time varying charge densities and electric fields caused by the symmetric inward emission of electrons are computed for the interior of a hollow sphere and cylinder. The Vlasov equation is derived in spherical and cylindrical coordinates. A quasi-static assumption is made. Electric fields are computed at the end of each time step. Several different methods of obtaining the charge density and field at each time step are discussed, all based on tracing characteristic curves of the Vlasov equation. The simplest of these methods is implemented. The distribution is stored in a discretized phase space, and particles are redistributed to phase points at the end of each time step. A coarse grid is used and numerical techniques are designed so as to expend minimal computer resources. A Maxwellian input distribution is assumed and several sample results are presented. Author (GRA)

N74-25711# PRC Information Sciences Co., McLean, Va.

DEVELOPMENT OF COST ESTIMATING RELATIONSHIPS FOR FLEETSATCOM, VOLUME 1 Final Report, 15 Jun. 1973 - 14 Jan. 1974

Eugene R. Brussell and Fernando Heyer 14 Jan. 1974 178 p refs

(Contract N00014-73-C-0519)

(AD-775628; PRC-R-1800) Avail: NTIS CSCL 17/2

Historical data relating to the cost and physical and performance characteristics of equipment comparable to the FLEETSATCOM system elements have been collected and analyzed. CER's that relate the cost to performance or physical parameters have been derived for the FLEETSATCOM system elements. Estimates of the cost uncertainty associated with each of the FLEETSATCOM system elements have been incorporated into a computer program with the resultant output a probability distribution of the costs of the total FLEETSATCOM system. Finally, throughout the report the CER's have been validated by applying them to the technical and physical parameters and for the planned quantities, as of September 1973, of the FLEETSATCOM system elements. Author (GRA)

N74-25712# Logistics Management Inst., Washington, D.C.

REVIEW OF THE MANAGEMENT STRUCTURE AND ACQUISITION PLAN OF THE SANGUINE SYSTEM

Mar. 1974 27 p refs

(Contract SD-321)

(AD-776257; LMI-7411) Avail: NTIS CSCL 17/2

The report reviews recommendations made in an earlier study (LMI Task 69-18) to determine if any changes to those recommendations were advisable or necessary in light of changes in the SANGUINE System and DoD policies since that earlier report was issued. The report concludes that the earlier recommendations should be changed by virtue of funding constraints which have recently been placed on SANGUINE as well as the development of SANGUINE as a project within the Special Communications (SPECOM) Project Office of the Naval Electronic (NAVELEX) Systems Command since the earlier report was issued. The major recommendations which are made relate to the retention by the Navy of the option to break out the facilities portion of SANGUINE for competitive solicitation and award during the production phase and the location of the SANGUINE Project Office within the SPECOM organization of NAVELEX. Author (GRA)

N74-25713# Aerospace Corp., El Segundo, Calif.

OBLIQUE RESONANCES EXCITED IN THE NEAR FIELD OF A SATELLITE-BORNE ELECTRIC-DIPOLE ANTENNA Technical Report, Aug. 1971 - Nov. 1973

Harry C. Koons, Davis C. Pridmore-Brown, and Donald A. McPherson Feb. 1974 25 p refs

(Contract F04701-73-C-0074)

(AD-776043; TR-0074(9260-08)-3; SAMSO-TR-74-43) Avail: NTIS CSCL 09/5

Near-field patterns of a short electric-dipole antenna were measured in the magnetospheric plasma by an instrument aboard the polar orbiting satellite OV1-20S. The most common antenna pattern observed at the fixed operating frequency, 300 kHz, was a dominantly biconic pattern with major axis parallel to the geomagnetic field. The measured cone angles are in reasonable agreement with those predicted by warm plasma theory. There was no discernible systematic asymmetry in these angles such as could be attributed to field-aligned currents in the plasma or to the motion of the satellite through it. Author (GRA)

N74-25714# Oklahoma State Univ., Stillwater. Stillwater Research Foundation Electronics Lab.

S-BAND RADIOSONDE TRANSMITTERS

Leonard J. Skach Nov. 1973 15 p

(Contract F19628-72-C-0139; AF Proj. 7659)

(AD-776062; 02Scientific; AFCRL-TR-73-0743) Avail: NTIS CSCL 04/1

The project involved the design and testing of a transmitter suitable for use as a source of radiation in connection with

data related to the analysis of a 2200 to 2300 MHz (S-band) tracking system. The basic requirements were: capability of launch via small balloon, low cost, 2-3 hour operation time, approximately 50 mw output, tunability over the frequency range of 2200 to 2300 MHz, and relatively stable operation with relation to environment. The design related to this transmitter required review and analysis of information relating to the specific transistor chosen as well as information on types of capacitors usable at the frequencies involved. The prescribed requirements were met by the design herein presented. In addition to the basic frequency requirement, the unit could also quite easily be tuned to operate in the 1435 to 1535 MHz region or the standard 1680 MHz radiosonde frequency, thus extending the versatility of the transmitter to use with either tracker systems.
Author (GRA)

N74-25715# Aerospace Corp., El Segundo, Calif.
INTERFERENCE SUSCEPTIBILITIES OF AEROSPACE MODEL MH 1973 VLF RECEIVERS Technical Report, Sep. - Nov. 1973
David P. Cauffman, Wallace B. Harbridge, Cecil W. Jordan, and Harry C. Koons 25 Feb. 1974 17 p refs
(Contract F04701-73-C-0074)
(AD-776045; TR-0074(9260-08)-4; SAMSO-TR-74-44) Avail: NTIS CSCL 17/2

The document reports on the results of tests conducted to establish quantitative electromagnetic cleanliness specifications for spacecraft carrying Aerospace Corporation Model MH 1973 broadband VLF radio receivers. It is essential that electromagnetic interference generated by the spacecraft and its payloads be reduced to levels comparable to the sensitivity of the receiver. Interference may be caused by conducted emissions on the power line or by radiated emissions encountered at the antennas. Harmonics and intermodulation products caused by strong signals outside the receiver bandwidth must be considered. The specifications derived from the tests are summarized and graphically shown. These specifications include no safety margin. (Modified author abstract) GRA

N74-25716# Naval Research Lab., Washington, D.C.
LOW-FREQUENCY PROPAGATION IN THE COMPOSITE REGION OF A WEDGE AND TWO PARALLEL PLATES Interim Report
John F. Ahner 12 Nov. 1973 24 p refs
(AD-775587; NRL-7613) Avail: NTIS CSCL 20/14

Wave propagation in the composite region of a wedge which leads into a duct was considered where mixed boundary conditions were imposed. The problem was reformulated as an integral equation where, instead of the free-space Green's function being used as the Kernel function, the Green's function for the wedge region was used. This permitted considerable simplification, and a Fredholm integral equation of the second kind was obtained where the region of integration is merely a plane and is valid for any value of the wave number. For small values of the wave number the boundary integral equation may be solved iteratively, and the solution is given as a Neumann series.
Author (GRA)

N74-25717# Test Group (6585th), Holloman AFB, N.Mex.
RADAR CROSS SECTION AND ANTENNA GAIN MEASUREMENTS OF A BQM-34F TARGET DRONE Final Report
Oct. 1973 540 p
(AD-775983; AFSWC-TR-72-20-Vol-3A) Avail: NTIS CSCL 17/9

Static radar cross section data were acquired from a BQM-34F remotely piloted vehicle (RPV) at the U. S. Air Force Radar Target Scatter Facility, (RAT SCAT), 6585th Test Group, Holloman AFB, New Mexico. The BQM-34F vehicle was configured to provide comparison data for several combinations of RCS and/or Infrared (IR) augmentation pods. Both monostatic and 10 degree bistatic data were obtained for eight vehicle roll angles and six vehicle pitch angles. Horizontal and vertical polarizations were used at a frequency of 9130 MHz. The report contains a description of the measurement conditions as well as reproductions of the raw and processed data acquired. (Modified author abstract) GRA

N74-25718# Naval Research Lab., Washington, D.C.
TARGET-GENERATED RANGE ERRORS
David C. Cross and James E. Evans Jan. 1974 29 p refs
(NRL Proj. R02-24; NRL Proj. R02-31A)
(AD-775590; NRL-MR-2719) Avail: NTIS CSCL 17/9

Radar range tracking systems employing a narrow RF bandwidth are subject to range scintillation errors which are generated by complex targets, including multipath propagation. The errors can be many times the actual target extent. In the narrow-band case, the errors are of the same form as angle scintillation. This similarity allows the general rules applying to angle scintillation to be applied to estimate range errors for complex targets. As bandwidth is increased, range scintillation is reduced. When bandwidth is sufficient to resolve the individual parts of the target, scintillation is reduced completely and the target range is always confined within the target's physical extent. The range location of the target can be a center-of-gravity or some particular point of interest on the target, depending on how the data is processed. Since a practical system cannot resolve all complex targets, the case of partial resolution is also investigated to determine range error as a function of resolution from fully unresolved to fully resolved. Author (GRA)

N74-25719# Naval Ordnance Lab., White Oak, Md.
EFFECT OF BACKGROUND ESTIMATION ON THE SENSITIVITY OF SONAR OR RADAR RECEIVERS
C. Nicholas Pryor and Gary M. Hess 19 Apr. 1973 61 p refs
(AD-775893; NOLTR-73-53) Avail: NTIS CSCL 09/4

Radar and sonar receivers usually operate in a noise background of unknown level. In order to maintain a constant false alarm rate, they often include circuits to estimate this background level. A technique is derived for determining the performance loss caused by background estimation. The loss is evaluated for several systems with Gaussian statistics and for narrow-band systems with square law, envelope, and logarithmic detectors. The loss depends on the type of system, the false alarm probability desired, and the size of the sample used in the background estimation. Author (GRA)

N74-25720# Systems Control, Inc., Palo Alto, Calif.
CAPACITY IMPROVEMENT OF OPTICAL COMMUNICATION SYSTEMS VIA OPTIMAL QUANTUM STATE GENERATION Final Report
Horace P. Yuen 28 Feb. 1974 56 p refs
(Contract N00014-73-C-0407)
(AD-775888) Avail: NTIS CSCL 17/2

In previous theories of optical communication, the freedom of quantum state generation has not been taken into account. In this work, the potential performance improvement is investigated when such freedom is included in the design of the quantum transmitter and the quantum receiver. The properties of a new class of radiation states are developed for applications to such state generation for the additive noise radiative loss channel. With state generation in the quantum receiver, it is shown that one can eliminate the quantum noise for the strongly attenuating channel. With state generation at the quantum transmitter, one can further increase the capacity to near optimal both in the classical and the quantum limit. The resulting performance gain is tremendous for typical optical parameter values, and practical means of realizing such systems should be sought.
Author (GRA)

N74-25721# Harry Diamond Labs., Washington, D.C.
A DISCUSSION OF EXCESSIVE RAINFALL ATTENUATIONS AT MILLIMETER WAVE LENGTHS
Walter J. Brinks Jul. 1973 29 p refs
(DA Proj. 1T0-61101-A-91A)
(AD-776342; HDL-TM-73-14) Avail: NTIS CSCL 20/14

The report investigates work that has been done in the measurement and prediction of the attenuation of millimeter waves by rainfall. In this report, rainfall attenuation refers solely to that caused by the liquid phase; this is over and above that due to water vapor and the other gaseous components of the atmosphere. Also, since relatively little has been done in the actual millimeter region, attention will also be given to the neighboring short centimeter wave region. The report examines the correlation between theoretical predictions of rainfall attenuation and the attenuation actually measured. This correctly implies that the correlation is not perfect in some ways. GRA

N74-25722# Bell Aerospace Co., Buffalo, N.Y.
OPTIMAL DIGITAL VOICE TRANSMISSION VOCOPLEXER Final Report, 29 Jun. 1971 - 22 Feb. 1973
John Hrinkevich Feb. 1974 82 p
(Contract F30602-71-C-0357)
(AD-776812; RADC-TR-74-8) Avail: NTIS CSCL 17/2

The Vocoplexer technique for reducing the transmission rate of a digitized multi-channel communications system was investigated. Statistical processing of PCM digitized voice to remove the idle time periods was analyzed and experimental hardware was designed and fabricated. The equipment built includes separate transmit and receive processors which function to compress the digitized output rate of a TD-353/U, 48-channel PCM multiplexer for transmission and then restore it to its original rate, following reception. Circuitry is included to interface with tropospheric scatter Radio Set AN/MCR-98 at its intermediate frequency of 70 MHz. Voice channel loading is provided through the use of 48 cassette tape players and an audio monitoring unit. The recorded voice tapes used are adjusted in content to provide an individual channel activity factor of 0.25. (Modified author abstract) GRA

N74-25723# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EXPERIMENTAL ELF RECEIVER
Steven L. Bernstein, Dale A. McNeill, Ogden G. Nackoney, and Ira Richer 11 Sep. 1973 131 p refs
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-776796; TR-492; ESD-TR-73-242) Avail: NTIS CSCL 17/2

The advantages of utilizing the ELF band for communications to submarines are principally the low attenuation rate of ELF signals in seawater, and the low attenuation rate in the earth-ionospheric waveguide. ELF transmitters, however, require high input power. Therefore, efficient signaling schemes and sophisticated receiver designs which help minimize the required transmitter power, and hence system costs, are particularly important. This report considers one such signaling scheme - binary convolutional encoding with antipodal modulation of a band-spread minimum-shift-keyed (MSK) carrier -- presents the design and performance of an experimental ELF receiver which includes several unique features to maximize efficiency. The receiver includes several adaptive elements such as the compensation of the ocean propagation medium, nonlinear processing of the non-Gaussian ELF noise, tracking notch filters for interference rejection, and a sequential decoder for reliable decoding at low SNR. Receiver tests included real-time reception of test messages aboard a submerged submarine in the Atlantic Ocean.
Author (GRA)

N74-25724# Stanford Research Inst., Menlo Park, Calif.
AECO (AUTOMATIC ELECTRIC COMPANY) AUTOVON (AUTOMATIC VOICE NETWORK) SWITCH HEMP (HIGH ALTITUDE ELECTROMAGNETIC PULSE) PERFORMANCE STUDY Final Report, Jul. 1972 - Feb. 1974
E. Neal Clark and Jonathan A. Frost Feb. 1974 184 p refs
(Contract DCA100-72-C-0042)
(AD-776671) Avail: NTIS CSCL 17/2

The report comprises a description of the AECo AUTOVON switch, followed by a preliminary assessment of switch vulnerability to HEMP, in twenty critical circuits. The switch description covers the physical arrangement, the functional operations of the various subsystems in processing a call, the synchronization and timing of subsystem functions, and the automatic maintenance and diagnostic features of the switch. The vulnerability assessment takes into consideration the wiring, the interconnecting cable locations and lengths, and the component card circuits. The expected failure mode of each critical circuit is included.
Author (GRA)

N74-25725# Radio Corp. of America, Camden, N.J.
LSI DIGITAL SUBSYSTEMS FOR COMMUNICATIONS Final Report, 1 Jul. 1971 - 28 Sep. 1973
R. Norwalt, M. Clarrocca, and R. Bergman Mar. 1974 141 p
(Contract DAAB07-71-C-0367; DA Proj. 1S7-62705-A-440)
(AD-777007; ECOM-0367-F-71) Avail: NTIS CSCL 17/2

The report describes work relating to the application of LSI (large scale integration) technology. Three distinct tasks have been defined. Task A involves the combination of a silicon-on-sapphire/large scale integration (SOS/LSI) logic circuit with a voltage controlled oscillator (VCO), a phase comparator, and a crystal reference oscillator to provide a complete digital frequency synthesizer. Task B relates to the development of a monolithic CMOS LSI Digital Time Division Crosspoint Switch array. Task C consists of the development, test, and delivery of sample quantities (20) of a P-MOS LSI array that implements a portion of the digital logic of a radiation measuring instrument. These three tasks represent demonstration of several distinct applications of the MOS LSI technology. Custom design techniques were used for Task A which was implemented in the very high speed, low power CMOS/SOS technology. Standard cell design automation techniques were used in the design phase of the bulk silicon CMOS LSI array described in Task B. A third approach using the gate Universal P-MOS LSI array represents yet another facet of the MOS technology. (Modified author abstract) GRA

N74-25943 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TELEMETRY
A. Becker *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 13 p refs (For availability see N74-25933 15-14)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-25726*# Syracuse Univ., N.Y. Dept. of Electrical and Computer Engineering.
THE DATA ARRAY, A TOOL TO INTERFACE THE USER TO A LARGE DATA BASE Final Report
Garth H. Foster Jan. 1974 59 p refs
(Grant NGR-33-022-150)
(NASA-CR-139012) Avail: NTIS HC $6.00 CSCL 05B

Aspects of the processing of spacecraft data is considered. Use of the data array in a large address space as an intermediate form in data processing for a large scientific data base is advocated. Techniques for efficient indexing in data arrays are reviewed and the data array method for mapping an arbitrary structure onto linear address space is shown. A compromise between the two forms is given. The impact of the data array on the user interface are considered along with implementation. Author

N74-25727*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-360 COMPILER SYSTEM SPECIFICATION
A. E. Johnson, P. N. Newbold, C. W. Schulenberg, A. E. Avakian, S. Varga, P. H. Helmers, C. T. Helmers, Jr., and R. L. Hotz 25 Mar. 1974 327 p refs
(Contract NAS9-13864)
(NASA-CR-134283; IR-60-2) Avail: NTIS HC $19.50 CSCL 09B

A three phase language compiler is described which produces IBM 360/370 compatible object modules and a set of simulation tables to aid in run time verification. A link edit step augments the standard OS linkage editor. A comprehensive run time system and library provide the HAL/S operating environment, error handling, a pseudo real time executive, and an extensive set of mathematical, conversion, I/O, and diagnostic routines. The specifications of the information flow and content for this system are also considered. Author

N74-25728*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-360-USER'S MANUAL
R. E. Kole, P. H. Helmer, and R. L. Hotz 18 Feb. 1974 202 p
(Contract NAS9-13864)
(NASA-CR-134284; IR-58-5) Avail: NTIS HC $13.25 CSCL 09B

This is a reference document to be used in the process of getting HAL/S programs compiled and debugged on the IBM 360 computer. Topics from the operating system communication to interpretation of debugging aids are discussed. Features of HAL programming system that have specific system/360 dependencies are presented. J.A.M.

N74-25729*# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.

[EVALUATION OF THREE CODING SCHEMES DESIGNED FOR IMPROVED DATA COMMUNICATION] Final Report

R. W. Snelsire May 1974 102 p refs
(Grant NGR-41-001-036)
(NASA-CR-138466) Avail: NTIS HC $8.25 CSCL 09B

Three coding schemes designed for improved data communication are evaluated. Four block codes are evaluated relative to a quality function, which is a function of both the amount of data rejected and the error rate. The Viterbi maximum likelihood decoding algorithm as a decoding procedure is reviewed. This evaluation is obtained by simulating the system on a digital computer. Short constraint length rate 1/2 quick-look codes are studied, their performance is compared to general nonsystematic codes. Author

N74-25730*# Intermetrics, Inc., Cambridge, Mass.

HAL/S PROGRAMMER'S GUIDE

P. M. Newbold and R. L. Hotz 9 Apr. 1974 148 p
(Contract NAS9-13864)
(NASA-CR-134285; IR-63-2) Avail: NTIS HC $10.50 CSCL 09B

The structure and symbology of the HAL/S programming language are described; this language is to be used among the flight software for the space shuttle project. The data declaration, input/output statements, and replace statements are also discussed. J.A.M.

N74-25731# Joint Publications Research Service, Arlington, Va.

ALGORITHM FOR CONTROLLING A WALKING APPARATUS CAPABLE OF OVERCOMING OBSTACLES

D. Ye. Okhotsimskiy and A. K. Platonov 17 May 1974 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk. SSSR, Tekhn. Kibernetika (Moscow), no. 5, 1973 p 3-10
(JPRS-62018) Avail: NTIS HC $4.00

The problem of synthesizing algorithms for controlling a six-legged walking machine equipped with a high-speed digital computer and a measuring system is examined. Author

N74-25732# Lincoln Lab., Mass. Inst. of Tech., Lexington.

SUCCESSIVE TESTS FOR A FAST METHOD OF GENERATING DIGITAL RANDOM NUMBERS

Y. Moriyama and S. Kitamura Mar. 1973 3 p refs Transl. into ENGLISH of paper presented at Elec. Eng. Conf., Hokkaidi, Japan, 1972
(NTC-74-50409; Rept-73-80) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616 CSCL 09B

A three-dimensional successive test in order to check the uniformity of a group of three successive random numbers is discussed. Author

N74-25733*# Intermetrics, Inc., Cambridge, Mass.

HAL/S-FC COMPILER SYSTEM FUNCTIONAL SPECIFICATION

29 Apr. 1974 83 p
(Contract NAS9-13864)
(NASA-CR-134295; IR-59-3) HC $7.25 CSCL 09B

The functional requirements to be met by the HAL/S-FC compiler, and the hardware and software compatibilities between the compiler system and the environment in which it operates are defined. Associated runtime facilities and the interface with the Software Development Laboratory are specified. The construction of the HAL/S-FC system as functionally separate units and the interfaces between those units is described. An overview of the system's capabilities is presented and the hardware/operating system requirements are specified. The computer-dependent aspects of the HAL/S-FC are also specified. Compiler directives are included. Author

N74-25734*# Scientific Translation Service, Santa Barbara, Calif.

INPUT-OUTPUT SYSTEM IN BASIC LANGUAGE FOR THE HP 2116B COMPUTER

Franco Palutan Washington NASA Jun. 1974 29 p refs Transl. into ENGLISH from the Italian report
(Contract NASw-2483)
(NASA-TT-F-15636) Avail: NTIS HC $4.50 CSCL 09B

Input output routines in BASIC for use with the HP 2116b computer are presented. The limitations of BASIC to teletype conversational mode were overcome to permit its use with other peripheral equipment. The I/O sequences and deck card structure are detailed. Author

N74-25735# Cambridge Univ. (England). Dept. of Engineering.

HYDRA: HYBRID DATA RECORDING APPARATUS

J. Billingsley and S. H. Shellswell 1973 14 p
(CUED/B-Control.TR52) Avail: NTIS HC $4.00

A description is given of a hybrid recording apparatus with the power to process large quantities of plant data, both analytically and as input for analog simulations. The duty of such a logger is to take low level signals from transducers in a environment hostile both chemically and electrically, to amplify and if necessary, filter them, to convert the signals to digital form and record them on magnetic tape in a format compatible with the ICL 4130 readers. Such a logger is seen to contain four parts; a process interface unit (PIU) to amplify and perhaps filter the transducer signals, a multiplexing analog to digital converter (ADC) to select and digitise the amplified signals, a magnetic tape unit (MTU) on which to record the data, and a logic and control unit to convert the digital signals to tape compatible form, and to control both ADC channel selection and the magnetic tape unit. Author

N74-25736# Aeronautical Research Labs., Melbourne (Australia).

A SMALL SOFTWARE MONITOR FOR THE PDP-10 COMPUTER

R. C. Adams Dec. 1973 23 p refs
(ARL/SM-346) Avail: NTIS C $4.25

A small software monitor is described for the PDP-10 computer. The purpose of this monitor is to analyze the use of resources and to identify which are the principal bottlenecks limiting throughput. It is not a performance monitor and for example, does not measure the overheads involved in the operating system. The report explains the aims of the project, the basic concepts, the implementation, and how to use the results. A very brief introduction is given to the PDP-10 for the benefit of readers unfamiliar with the machine. There is an equally short review of monitoring techniques to help a reader place this project in perspective with other possible approaches. Author

N74-25737# Gesellschaft fuer Mathematik und Datenverabeitung, Bonn (West Germany). . Inst. fuer Informationssystemforschung.

STRUCTURE OF A QUESTION-ANSWER SYSTEM BASED ON SET THEORY [STRUKTUR EINES FRAGE-ANTWORT-SYSTEMS AUF MENGENTHEORETISCHER GRUNDLAGE]

Klaus-Dieter Kraegeloh and Peter Lockemann 1972 130 p refs In GERMAN Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-GMD-55) Avail: NTIS HC $9.50

A question-answer system combining a syntactic mode and a semantic mode of interrogation was investigated. A method is presented to compare the interrogative modes on the basis of symbolic logic. This method was applied to a set theoretical data bank structure. It is shown that the efficiency of the question-answer system can be improved by introduction of elements of a logic method to a data basis, based on data structures. Further improvement is obtained when the set theoretical formulation is attended by special quantors such as additional language elements. Special problems occur in chaining such quantors. Methods of structuring the data bank are studied that compare problems in data input with those in interrogation, as well as definitions for nonoriented extension of access possibilities. ESRO

N74-25738# Gesellschaft fuer Mathematik und Datenverabeitung, Bonn (West Germany). Inst. fuer Theorie der

Automaten und Schaltnetzwerke.
PARAMETER DEPENDENT CIRCUITS AND AUTOMATA [PARAMETERABHAENGIGE SCHALTUNGEN UND AUTOMATEN]
Klaus J. Weschenfelder 1972 113 p refs In GERMAN
Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-GMD-59) Avail: NTIS HC $8.75

The problems of technical realization of nondeterministic switching functions, especially allowing for threshold logic and the parameter-dependent realization of sets of such switching functions were investigated. The analysis and synthesis of parameter-dependent (nondeterministic) automata are discussed, and possible applications of the principle of parameter-dependency are reviewed. ESRO

N74-25739# University of Southern Calif., Marina del Rey. Information Sciences Inst.
PRIM OVERVIEW
Leroy C. Richardson Feb. 1974 12 p refs
(Contract DAHC15-72-C-0308; ARPA Order 2223-1)
(AD-775648; ISI/RR-74-19) Avail: NTIS CSCL 09/2

Programming Research Instrument, PRIM, is an experimental computing environment, accessible through the ISI TENEX system, in which each researcher can create his own specialized computing system, capable of being quickly adapted to specific needs. PRIM consists of the ISI TENEX System and an MLP-900 microprogrammable processor, operating with shared main memory. The document serves as an introduction to a four part user's manual and briefly describes the MLP-900 system, the TENEX interface, and the user software available for using this unique facility. Author (GRA)

N74-25740# Illinois Univ., Urbana. Coordinated Science Lab.
MACHINE PERCEPTION OF OBJECTS WITH CURVED SURFACES
Yean Hsi Chang May 1974 134 p refs
(Contract DAAB07-72-C-0259)
(AD-776163; R-641; UILU-ENG-74-2205) Avail: NTIS CSCL 09/2

In the paper, a vision system which handles objects with curved surfaces is presented. This system takes as input a list of vertices in a two dimensional line-drawing of a three dimensional scene of bodies which possess both flat and curved surfaces. It subsequently analyzes the line-drawing and gives a description of the complete scene as a final result. In this system, the body finding is done by boundary tracings and the description is given by prototype body names with modifiers. This system is implemented in LISP 1.6 on the PDP-10 computer at the Coordinated Science Laboratory, University of Illinois, Urbana-Champaign. (Modified author abstract) GRA

N74-25741# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
EXPLORATORY DEVELOPMENT OF MAGNETIC BUBBLE DOMAIN MATERIAL FOR APPLICATION IN AIR FORCE SOLID STATE MASS MEMORY SYSTEMS Interim Report, 27 Nov. 1972 - 30 Apr. 1973
D. M. Heinz and R. D. Henry Aug. 1973 30 p refs
(Contract F33615-73-C-5017; AF Proj. 7371)
(AD-775715; C73-4.5/501; AFML-TR-73-153) Avail: NTIS CSCL 09/2

Tests performed on bubble domain materials indicate that they are resistant to mechanical stresses of 50g. In a study of FMR and bubble domain wall mobility, it was found that the mobility is quite temperature sensitive over the range of interest, that FMR gives an upper bound but not a true value of mobility and that the exchange constant is about 0.6 of the normally assumed value for bubble domain compositions. An investigation aimed at selecting a composition to meet Air Force computer memory goals indicates that lower wall energy materials will have to be employed to reach high data rates. Author (GRA)

N74-25742# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
EXPLORATORY DEVELOPMENT OF MAGNETIC BUBBLE DOMAIN MATERIAL FOR APPLICATION IN AIR FORCE SOLID STATE MASS MEMORY SYSTEMS Interim Report, 1 May - 31 Oct. 1973
D. M. Heinz, R. D. Henry, and F. S. Stearns Feb. 1974 32 p refs
(Contract F33615-73-C-5017; AF Proj. 7371)
(AD-775718; C73-4.11/501; AFML-TR-74-315) Avail: NTIS CSCL 09/2

In gallium-substituted iron garnets such as are used in bubble domain memories, the measured exchange constant values are lower than the normally used exchange constant values estimated from Neel molecular field theory. The measured values bring calculated wall energies into agreement with measured wall energies. From LPE (liquid phase epitaxy) film growth studies, the growth temperature has been found to be more influential than the growth rate on the amount of lead incorporated into a film from the flux. A new garnet material containing no magnetic rare earths has been prepared which has an appreciable uniaxial anisotropy. Author (GRA)

N74-25743# Texas Univ., Austin. Dept. of Electrical Engineering.
ADAPTIVE SYSTEMS Final Report, 1 Apr. 1969 - 31 Dec. 1972
D. G. Lainiotis Feb. 1974 24 p refs
(Grant AF-AFOSR-1764-69; AF Proj. 9769)
(AD-776015; AFOSR-74-0309TR) Avail: NTIS CSCL 09/2

The research effort constitutes an integrated study of adaptive systems for: (a) estimation and system identification; (b) detection and pattern recognition, as well as for feature extraction or data compression; (c) adaptive control; and (d) application of adaptive systems to (1) weather forecasting; (2) image recognition; and (3) speech recognition and synthesis. GRA

N74-25744# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
A MEASURE OF PATTERN RECOGNITION EFFECTIVENESS WITH APPLICATION TO FEATURE SELECTION
Joseph W. Duroux 15 Feb. 1974 21 p refs
(Contract F04701-73-C-0074)
(AD-776819; TR-0074(9320)-3; SAMSO-TR-74-63) Avail: NTIS CSCL 09/2

A measure of effectiveness of a statistical pattern recognition process is suggested and applied to the problem of feature selection. The classification process is one which approximates the class populations by probability distributions in the feature space based on samples of prototype patterns. It uses a Bayes classifier. The suggested measure of effectiveness is a normalized estimate of mutual information obtained directly from the prototypes. The feature selection procedure chooses likely feature subsets and tests them against thresholds related to the effectiveness of the full set of features. The subsets are chosen by ordering the original features according to individual effectiveness and then alternately truncating and permuting the remaining space until a minimum is reached. The minimum is quasioptimum in the sense that it contains no useless features. Author (GRA)

N74-25745# Ultrasystems, Inc., Newport Beach, Calif. Information Systems Div.
TECHNIQUES FOR THE DESIGN AND EVALUATION OF SELF-CHECKING SYSTEMS Final Report
Behrooz Parhami 28 Feb. 1974 44 p refs
(Contract N00014-72-C-0495)
(AD-775909) Avail: NTIS CSCL 09/2

The report deals with techniques for the analysis and synthesis of self-checking systems composed of self-checking subsystems. After a brief introduction to the basic concepts of self-checking systems, a graph model for the representation of modules and their interconnections is presented. It is assumed that small self-checking modules can be synthesized by a trial-and-error approach to through the use of two-rail design. Techniques for combining self-checking modules into self-checking systems are discussed and the problem of optimal placement of checkers is considered. A procedure for evaluating the performance of a self-checking system is given. Author (GRA)

N74-25746# Stanford Univ., Calif. Dept. of Computer Science.
MEMORY MODEL FOR A ROBOT
W. A. Perkins Jan. 1974 119 p refs
(Contract DACH15-73-C-0435; ARPA Order 2494)

(AD-775645; SU-STAN-CS-74-406; AIM-225) Avail: NTIS CSCL 06/4

A memory model for a robot has been designed and tested in a simple toy-block world for which it has shown clarity, efficiency, and generality. In a constrained pseudo-English one can ask the program to manipulate objects and query it about the present, past, and possible future states of its world. The program has a good understanding of its world and gives intelligent answers in reasonably good English. Past and hypothetical states of the world are handled by changing the state of the world in an imaginary context. Procedures interrogate and modify two global databases, one which contains the present representation of the world and another which contains the past history of events, conversations, etc. The program has the ability to create, destroy, and even resurrect objects in its world. Author (GRA)

N74-25945 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
DATA PROCESSING
J. Perrochon and J. T. M. VanDoorn *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 14 p refs (For availability see N74-25933 15-14)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-25747# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONTINUOUS SECONDARY-ELECTRON MULTIPLIER FOR THE MEASUREMENT OF SMALL CURRENTS OF LOW-ENERGY ELECTRONS
G. Blasek Jan. 1973 4 p refs Transl. into ENGLISH from Exp. Tech. Physik (Berlin), v. 18, no. 1-2, 1970 p 13-16
(Rept-73-45) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The characteristics of a continuous secondary electron multiplier with a cylindrical sheathed electrode are discussed. It is stated that the multiplying factor of the secondary electron multiplier depends not only on the angle of inclination of the dynode surface and the extraction voltage, but also on the sheath voltage. It reaches its maximum with optimal choice of these parameters. A circuit diagram of the electron multiplier equipment is provided. Graphs are included to show the relationship of the parameters of the multiplier and the electrical properties. Author

N74-25748# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RELIABILITY OF HgTe-CdTe PHOTOVOLTAIC DETECTORS
J. Ameurlaine Jan. 1973 15 p refs Transl. into ENGLISH from High Reliability Electron. Components Intern. Conf. (Toulouse), 6-10 Mar. 1972 p 465-475
(NTC-74-50412; Rept-73-39) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The use of photovoltaic detectors in space programs (ATS, METEOSAT) has made necessary a study of the reliability of this type of detector. The study, having a physicochemical rather than a statistical nature, has resulted in an improved stability in time of this component. The study plus the perfection of a highly reliable encapsulation have made it possible to use the detectors in future space missions. Author

N74-25749# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE ELECTRODE CURRENT EFFECT IN THE ELECTRIC LUMINESCENCE OF THIN ZnSeCu, Mn FILMS
B. S. Yugas, V. G. Irza et al Apr. 1973 4 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 17, no. 9, 1972 p 1559-1560
(NTC-74-11850; Rept-73-113) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The electrical luminescence properties of zinc selenium-copper, manganese luminophors are discussed. The effect of an exciting alternating voltage of constant amplitude on the brightness of the luminescence was investigated. The effect was observed on luminescent samples with excitation supplied by both an alternating and a constant field. The samples luminescing only with excitation by a constant field, responded weakly to the effect. The resistance of the transparent electrode was usually two to three kilo-ohms. Diagrams of the experimental equipment used in making the tests are provided. Author

N74-25750# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE EXPERIMENTAL INVESTIGATION OF THE COUPLING IMPEDANCE OF RESONATOR CHAINS WITH A POSITIVE MUTUAL INDUCTANCE COEFFICIENT
V. I. Pravda and K. Ya. Lizhdvoi Mar. 1973 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radioelektron. (Kiev), v. 15, no. 8, 1972 p 1037-1041
(NTC-74-11940; Rept-73-83) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Experimental results are shown for the mutual impedance of retarding systems formed from resonator chains with a positive mutual inductance coefficient. These results show the mutual impedance as a function of the geometrical dimensions. Author

N74-25751# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PHENOMENON OF NECKING OR CONSTRICTION OF THE CURRENT TUBE IN FIELD-EFFECT DEVICES
P. David May 1973 14 p refs Transl. into ENGLISH from Onde Elec. (France), v. 50, 1970 p 33-42
(NTC-74-11931; Rept-73-130) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The saturation effect of physical magnitudes in a field effect device which is sensitive to carrier speed limitation is analyzed. A short channel structure defined by two parallel cylindrical gates is used in the investigation. Application of high drain voltages between source and drain created a conduction neck of limited cross section in which the carrier speed approaches the limit. The analysis of the short channel structure is extended to the case where the carrier speed limitation becomes appreciable. Author

N74-25752# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LIGHT-INDUCED PYROCURRENTS IN FERROSEMICONDUCTORS
N. M. Bezdetnyi, A. Kh. Zeinally et al Apr. 1973 4 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 17, no. 8, 1972 p 1359-1360
(NTC-74-11867; Rept-73-118) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Data from the investigation of the photo response from pulse illumination in the process of establishing an equilibrium domain structure in unipolar SbSI crystals are presented. Crystals with an identical direction of electric fields at the contacts were investigated. A diagram of the crystal response during heating and cooling is provided. It was determined that the direction and amplitude of pulses is restored in reverse sequence according to the degree of completion of the ferro-electric transition. The characteristics of the pyrocurrent induced in the crystal by light effects are described. It was determined that a pyrocurrent induced by light in stationary temperature conditions may be observed only once (with sufficient intensity and duration of the light pulse) if the process of establishing equilibrium is not completed. Author

N74-25753# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VARIABLE DIRECTIONAL COUPLER FOR MICROWAVES
M. R. E. Bichara, F. Arfaras et al Feb. 1973 4 p Transl. into ENGLISH from Compt. Rend. Acad. Sci. (Paris), v. 275, no. 12, 1972 p 411-413
(NTC-74-11894; Rept-73-75) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Described is the principle utilized to vary the degree of coupling of a directional coupler. An example with experimental results demonstrates the possibility of realizing practically a coupling variation from +22.4 db to -33.2 db in the X-band. Author

N74-25754# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A NEW PHOTOELECTRIC ELLIPSOMETER
J. Monin, J. Houdard, and G. A. Boutry Apr. 1974 5 p refs Transl. into ENGLISH from Compt. Rend. (Paris), B, v. 267, 1968 p 1078-1080
(NTC-74-11888; Rept-73-122) Avail: NTIS HC $4.00; National

Translations Center, John Crerar Library, Chicago, Ill. 60616
The photoelectric ellipsometer does not use any optical element (quarter-wave plate, compensator, etc.) whose properties vary with wavelength. The measuring process involves a magneto-optic modulation of the reflected elliptical vibration. It makes possible rapid measurements and very precise angular aiming (a few seconds). Its range of utilization extends to the visible and to the ultraviolet as far as 2500 A. Author

N74-25755# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CHARACTERISTICS OF GaAs SCHOTTKY BARRIER IMPATT DIODES
F. Hasegawa, Y. Aono, and K. Sekido Jun. 1973 30 p refs
Transl. into ENGLISH from "Papers of Technical Group on Electron Devices", IECE of Japan, report ED-72-5, 1972 p 1-13
(NTC-74-50415; Rept-73-150; ED-72-5) Avail: NTIS HC$4.50; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The fabrication and characteristics of gallium arsenide Schottky barrier IMPATT diodes are discussed. It is shown that equal ionization coefficients of electrons and holes, high electron mobility, and the existence of negative differential mobility in gallium arsenides contribute to the performance of the diodes. A graphical analysis indicates that the conversion efficiency of the gallium arsenide antimony IMPATT diode is about 1.8 times that of silicon IMPATT diodes. The measured noise level of gallium arsenide antimony IMPATT diodes is better that of silicon IMPATT diodes by about 15 db, and was almost comparable to that of Gunn diodes. Author

N74-25756# Physics Lab. RVO-TNO, The Hague (Netherlands).
CALCULATION OF THE ELECTROMAGNETIC PULSE SHIELDING EFFECTIVENESS OF SOLID-SHELL ENCLOSURES [BEREKENING VAN DE AFSCHERMING TEGEN EMP VAN GESLOTEN METALEN OMHULSELS]
P. A. A. Sevat Dec. 1973 62 p refs In DUTCH; ENGLISH summary
(PhL-1973-50; TDCK-63314) Avail: NTIS HC $6.25

Shielding against electromagnetic pulses (E.M.P.), as from nuclear explosions, was studied. The parameters of the E.M.P. were expressed in various analytical models. Using these models and the transfer function of the shielding enclosure, the time history of the field inside the enclosure was calculated. The results for three basic shapes of enclosure are recorded in parametric curves. With these curves the shielding effectiveness of each shape of solid-shell enclosure can be determined in a relatively simple way. The effect of apertures in the enclosure and the countermeasures are briefly discussed. Calculated values are compared with experimental results obtained with an enclosure exposed to a simulated E.M.P. Author (ESRO)

N74-25757# Ohio State Univ., Columbus. ElectroScience Lab.
AN EXPERIMENTAL, SPREAD SPECTRUM ADAPTIVE ARRAY Final Technical Report
C. W. Schwegman and R. T. Compton, Jr. Jan. 1974 64 p refs
(Contract N00014-67-A-0232-0009)
(AD-776193; ESL-3098-4) Avail: NTIS CSCL 09/5

An experimental four-element adaptive array for use in a PN-coded (spread spectrum), biphase modulated communication system is described. A reference signal generation loop suitable for such signals is described and certain aspects of its design are discussed. The experimental performance of the array with this reference loop is illustrated. A method of code acquisition and tracking is also described. It is shown how this system can provide significant interference protection during code acquisition, a feature not possible with many conventional spread spectrum systems. Finally, some experiments involving frequency-hopped signals are also described. Author (GRA)

N74-25758# McDonnell-Douglas Electronics, St. Louis, Mo.
SOLID STATE HIGH POWER AMPLIFIER FOR UHF Final Report, 3 Jan. - 3 Oct. 1973
Quentin E. Veit and Frank D. Hockett Oct. 1973 111 p refs
(Contract DAAB07-72-C-0335; DA Proj. 1S6-62071-A-448)
(AD-775847; ECOM-0335-F-72) Avail: NTIS CSCL 09/5

The report describes the effort expended on a program to develop a UHF broadband power amplifier. The distinguishing characteristics of the amplifier are an overall power gain of 10 db, an output power of 250 watts CW, and a frequency range of 620 to 960 MHz. The report discusses the preliminary design analysis and the resulting necessary design goals to realize the amplifier design. The results of experimental component evaluation and feasibility studies are included. Conclusions and recommendations are specifically identified. Author (GRA)

N74-25759# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
A LOW POWER RC-COUPLED VHF AMPLIFIER DESIGNED FOR FABRICATION BY HYBRID MICROCIRCUIT TECHNIQUES
G. R. Seylar Mar. 1974 51 p
(Contract N00017-72-C-4401)
(AD-776239; APL-TG-1232) Avail: NTIS CSCL 09/5

A low power, high gain, VHF amplifier was designed for use in the RF amplifier chain of a tuned radio frequency receiver for satellite applications. The curcuit design was directed toward a topology and component use compatible with efficient fabrication as a hybrid microcircuit. Operating parameters were selected to optimize the relationship of using the least number of components while achieving the highest gain efficiency (ratio of RF gain to dc power consumption). The report describes both the circuit design and the packaging techniques. Detailed electrical characterization of the resulting five-stage amplifier is also presented. Author (GRA)

N74-25760# Boeing Co., Seattle, Wash.
A STUDY OF ELECTRONICS RADIATION HARDNESS ASSURANCE TECHNIQUES. VOLUME 1: BACKGROUND, APPROACH, AND SUMMARY OF RESULTS Final Report, 31 Jul. 1970 - 16 Jul. 1973
I. Arimura, Allan H. Johnston, L. L. Sivo, and D. W. Egelkrout Kirtland AFB, N. Mex. AFWL Jan. 1974 150 p refs 3 Vol.
(Contract F29601-71-C-0001; AF Proj. 8809; AF Proj. 1338)
(AD-776026; AFWL-TR-73-134-Vol-1) Avail: NTIS CSCL 09/3

The report describes the results of a comprehensive study which was designed to determine improved techniques for providing radiation hardness assurance on modern electronic systems. The two basic goals considered were (1) to determine from physical reasoning and large scale testing the effectiveness of established electrical screening parameters and the existence of additional ones which might be correlated with radiation responses and (2) to establish a statistical comparison between the various hardness assurance techniques including electrical screening, lot sampling and irradiate-and-anneal. GRA

N74-25761# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
CHARACTERISTICS OF THE NLRO 18.3 METER PARABOLIC ANTENNA AT 400 MHz
John M. Benson and Stanley D. Shawhan Feb. 1974 88 p refs
(Contract N00014-68-A-0196-0003)
(AD-776252; U-of-Iowa-74-12) Avail: NTIS CSCL 09/5

Measurements were carried out on the 18.3 meter University of Iowa parabolic reflecting antenna using radioastronomical techniques at 400 MHz. The antenna beam pattern was found to be unsymmetrical with half-power widths of 2.75 degrees by 2.25 degrees. The aperture illumination provided by the log-periodic feed antenna is mainly responsible for a total aperture efficiency of 36%. The gain of the reflector antenna is 33.2 db and its directivity is 33.7 db. The most prominent side-lobes were observed to be at least 25 db down from the maximum response. The surface of the paraboloidal reflector itself has an rms deviation of approximately 1 cm from a true paraboloid. In terms of radio astronomy, the antenna perfromance factor is 0.034 K of antenna temperature per flux unit (10 to the minus 26th power watts/sq m/Hz). The pointing accuracy was found to vary randomly within plus or minus 0.25 degrees in elevation and azimuth. (Modified author abstract) GRA

N74-25762# Army Foreign Science and Technology Center, Charlottesville, Va.
CERAMIC THERMAL JUNCTION USED IN THERMOELEC-

TRIC DEVICES
E. N. Zvyagina 7 Nov. 1973 11 p refs Transl. into ENGLISH from Kholodil. Tekhn. Tehnol. (USSR), no. 9, 1970 p 17-23
(AD-776175; FSTC-HT-23-1084-72) Avail: NTIS CSCL 10/3

The paper considers the problem of developing effective thermal junctions which would differ favorable from those in current use by having minimal temperature drops and would not be inferior with respect to their electrical, mechanical and other properties. The greatest shortening of the thermal junctions currently used for thermoelectric batteries is the existence of significant temperature drops. GRA

N74-25763# Signatron, Inc., Lexington, Mass.
ELECTRONIC DEVICE MODELING Technical Report, 13 May - 13 Aug. 1973
L. Ehrman Jan. 1974 200 p
(Contract F30602-73-C-0193)
(AD-776091; RADC-TR-73-407; TR-2) Avail: NTIS CSCL 09/1

The software for implementation of the charge-control bipolar transistors model and the means for obtaining the parameters of the charge-control transistor model from experimental measurements are developed. A comparison of predicted and measured nonlinear distortion products based upon several junction field effect transistors is reported. Author (GRA)

N74-25764# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LOAD IMPEDANCE CHARACTERISTICS OF TRAPATT OSCILLATORS
Jerry D. Welch 9 Jul. 1973 115 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-776773; ESD-TR-73-183; TR-496) Avail: NTIS CSCL 09/5

A study was made of the impedance required to match the diode in a time-delay-triggered TRAPATT oscillator. The investigation includes both a theoretical analysis and an experimental verification. It provides the most accurate closed-form analysis of TRAPATT oscillator waveforms and efficiencies to date and resolves inconsistencies in the dynamics of the time-delay-triggering processes which have not been adequately explained in previously published analyses. A technique is given for determining the required diode matching impedance and presenting the impedance data in a single set of resistance and reactance curves valid for any fundamental frequency of oscillation. The analysis includes the parasitics of the package and mount and shows that the required matching impedance is strongly influenced by these parasitics; without them the chip itself would be a very broadband device. (Modified author abstract) GRA

N74-25765# Naval Research Lab., Washington, D.C.
THE 1200-TO-1300-MHz 100-WATT TRANSISTOR POWER AMPLIFIER Interim Report
R. E. Neidert and H. E. Heddings 5 Mar. 1974 12 p
(WF12111704)
(AD-776543; NRL-7682) Avail: NTIS CSCL 09/5

The report describes the development of a microwave transistor power amplifier having 100-W pulsed output power in the 1200-to-1300-MHz frequency range. The output stage of the amplifier incorporates four microwave power transistors combined with quadrature divided/combine networks. Practical amplifier and microstrip networks problems and solutions are discussed, and amplifier performance data are included. Author (GRA)

N74-25766# Naval Research Lab., Washington, D.C.
TWO-ELEMENT QUADRIFILAR ARRAY
Frederick R. Domer 8 Mar. 1974 18 p refs
(AD-776542; NRL-7671) Avail: NTIS CSCL 09/5

Several quadrifilar helices were built and tested, and a three-quarter-turn, quadrifilar helix was selected for use in a two-element vertical array as a fixed satellite ground antenna. A vertical array of two of the helices was then designed and tested. The pattern provided hemisphere coverage and has a fairly sharp cutoff at the horizon to reduce multipath effects. Impedance measurements, polar patterns, and radiation distribution plots of axial ratio, tilt angle, and polarization loss further verify that this antenna is applicable to satellite tracking. Author (GRA)

N74-25767# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE GRIDISTOR: SUCCESSOR TO THE TECNETRON
S. Teszner May 1973 34 p refs Transl. into ENGLISH from Ann. Telecomm. (France), v. 21, no. 7/8, 1966 p 157-168
(NTC-74-11882; Rept-73-133) Avail: NTIS HC $4.75; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The various structures of the gridistor are reviewed by a description of the recent steps in their development. Experimental results obtained up to the present time are discussed. Progress made recently is emphasized, and future prospects for laboratory and industrial applications are outlined. Author

N74-25768# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PULSE-PHASE MULTISTABLE ELEMENT AND PROBLEMS OF MICROMINIATURIZATION
N. Z. Goncharuk, V. I. Zubchuk, and V. A. Karpenko 25 Mar. 1974 10 p refs Transl. into ENGLISH from the book "Mnogoustoichivye Elementy i Ikh Primenenie. Sbornik Statei" USSR, 1971 p 119-123
(AD-776919; FTD-HT-23-1011-74) Avail: NTIS CSCL 09/1

Basic construction of pulse-phase multistable elements is reviewed. General deficiencies of that design are identified, particularly the instability of the level of operation as a result of aging of the semiconductor devices with negative resistance. A pulse-position multistable element is described which is free of such deficiencies. The voltage process, from input to output, is traced, and the advantages of the device over other elements is discussed. The dimensions of the complete unit are given, and laboratory results to calculate its efficiency are shown. A.A.D.

N74-25769# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SUMMARY OF RESULTS OF ANTENNA DESIGN COST STUDIES
J. C. Sureau 19 Feb. 1974 82 p
(Contracts F19628-73-C-0002; DOT-FA72WAI-261)
(AD-776914; ATC-22; FAA-RD-74-20) Avail: NTIS CSCL 09/5

The Discrete Address Beacon System (DABS) will provide the primary Air Traffic Control (ATC) surveillance information for the 1980-1990 time period as it is introduced gradually as a replacement for the present Air Traffic Control Radar Beacon System (ATCRBS). This report discusses and summarizes the results of two DABS antenna system design-cost trade off studies performed by industrial concerns with substantial design, fabrication and field maintenance experience related to similar antenna systems now in the field. The data from these studies, was to be used to support other Lincoln Laboratory DABS studies leading to the definition and specification of a cost-effective system design. GRA

N74-25770# International Business Machines Corp., Owego, N.Y. Electrics Systems Center.
DIELECTRIC MEMBRANE STORAGE DISPLAY TUBE Final Report, Jul. 1972 - Jul. 1973
Eugene T. Kozol Feb. 1974 43 p refs
(Contract F30602-72-C-0508)
(AD-776811; RADC-TR-74-7) Avail: NTIS CSCL 09/5

The report details a study of the resolution of a dielectric membrane display device. The areas of study included the analysis and selection of a deformable dielectric membrane, incorporation of this membrane into a sealed cathode ray tube, selection and modification of the writing electron gun, and subsequent testing of the complete display device to determine its resolution characteristics. The study results show that the resolution of the device could be increased from 280 to 440 lines per inch, by proper selection of the writing electron gun and the dielectric membrane. Author (GRA)

N74-25771# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
VARIABLE PULSE WIDTH MODULATOR (EXPLORATORY DEVELOPMENT MODEL) Triannual Technical Report, 1 Jul. - 31 Oct. 1973
William Scott Feb. 1974 24 p
(Contract DAAB07-73-C-0267; DA Proj. 1S6-62705-A-055)
(AD-777005; ECOM-0267-1-73) Avail: NTIS CSCL 09/5

The report provides design and test results achieved from prototype of Driver Amplifier and primary (CPSE) switch elements. Design concepts of the 1000 volt, 25 ampere Basic Switch Element are included, as are circuit areas requiring additional effort. (Modified author abstract) GRA

N74-25772# Microwave Applications Group, Chatsworth, Calif.
MICROWAVE RECIPROCAL LATCHING FERRITE PHASE SHIFTERS Semiannual Report, 1 Apr. - 30 Sep. 1973
Charles R. Boyd, Jr. Apr. 1974 54 p refs
(Contract DAAB07-73-C-0039; DA Proj. 1S6-62705-AD-57; MAG Proj. J73-033)
(AD-777006; ECOM-0039-2) Avail: NTIS CSCL 09/5

The report describes continued work of development of an S-band dual-mode reciprocal latching ferrite phase shifter using lithium-titanium ferrite. Particular emphasis is placed on the electronic driver and its interaction with the rf assembly to help stabilize phase shift performance over environmental conditions. Data on driver functions and sequence of operations is presented, as well as rf performance over temperature, and measured loss data up to a peak power level of more than 3.5 Kw. Additional studies of impedance matching have also taken place, and the results are summarized in this report. The main conclusions are that the junction susceptances between ferrite rod and waveguide are very important factors that can influence match. Systematic techniques for adjusting this junction susceptance and for establishing ceramic transformer dimensions have been worked out. Work has also begun on dual-mode phase shifters at C-band. Preliminary results indicate that a unit meeting bandwidth requirements can be met with reasonable ease. Insertion loss results are not as favorable, and it appears that meeting the goal of 1.0 db loss may be very difficult. Author (GRA)

N74-25773# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
USING THE PRINCIPLE OF OPTO-ELECTRONIC CONVERSION FOR MANUFACTURING CERTAIN DYNAMIC MULTISTABLE ELEMENTS
A. M. Sharadkin and P. F. Oleksenko 25 Mar. 1974 9 p refs Transl. into ENGLISH from the publ. "Mnogoustoichivye Elementy i Ikh Primenenie. Sbornik Statei" USSR, 1971 p 202-206
(AD-776920; FTD-HT-23-1016-74) Avail: NTIS CSCL 09/1

The advantages resulting from the opto-electronic conversion process for the microminiaturization of multistable elements are discussed. Mathematical models are developed to show the typical brightness of an injection diode as a function of voltage, the relay characteristics of an electroluminescent capacitor, and the characteristic of scintillation luminance of an electroluminescent capacitor as a function of frequency. A circuit diagram is provided to show the operating principles of the opto-electronic phase-pulsed multistable element. Author

N74-25774# Varian Associates, Palo Alto, Calif.
EFFICIENCY ENHANCEMENT IN MEGAWATT LEVEL BROADBAND MICROWAVE AMPLIFIERS Semiannual Technical Report, 17 Nov. 1972 - 31 May 1973
Robert Butwell Feb. 1974 19 p
(Contract F30602-73-C-0073; AF Proj. 5573)
(AD-776810; RADC-TR-74-3) Avail: NTIS CSCL 09/5

The report covers the first six months of effort on a theoretical and experimental investigation of methods of improving the conversion efficiency of relatively broadband linear beam amplifiers operating at a megawatt of peak power. An initial electrical design of an S-band cloverleaf Twystron amplifier has been accomplished. A mechanical layout drawing has been generated. The main cloverleaf circuits have a cold pass band of 18.2% and a minimum hot band interaction impedance of 540 ohms. Beam and circuit parameters were input to the large signal program. The computer predicted performance shows a 10% bandwidth with minimum efficiency of 43%. Predicted band center efficiency is 56%. Author (GRA)

N74-25775# Hughes Aircraft Co., Carlsbad, Calif. Industrial Products Div.
STORAGE CAMERA TUBE WITH NON-DESTRUCTIVE READOUT Quarterly Progress Report, 1 Oct. - 31 Dec. 1973
L. S. Yaggy Mar. 1974 18 p refs
(Contract DAAB07-73-C-0330; DA Proj. 1S7-62705-AH-94; DA Proj. 1S7-62705-AO-55)
(AD-776383; ECOM-0330-2-73; QPR-2) Avail: NTIS CSCL 09/1

The report describes the progress to develop a novel camera-tube capable of dual-mode operation, either as a real-time television camera-tube or as a storage camera-tube with non-destructive readout, switchable upon command. Mode-switching was accomplished successfully on the first complete device, and measurements of sensitivity at 1.06 micrometer wavelength on the second complete device essentially confirmed the original prediction. Separate electron-gun tests continued and have led to a tentative gun design which is expected to be consistent with program goals for resolution and storage-time with reduced raster-size while zooming. Photomasks were designed and ordered to provide for higher diode-array density and, hence, higher target-resolution. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-25776# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LOW VOLTAGE ELECTRO-LUMINESCENT ZnS, CuCl FILMS
N. A. Vlasenko and A. K. Savin Feb. 1973 4 p refs Transl. into ENGLISH from Zh. Prikl. Spektroskopii, Akad. Nauk Belorussk. SSR (Minsk), v. 16, no. 1, 1972 p 158-159
(NTC-74-11901; Rept-73-56) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The properties of low-voltage electroluminescent ZnS - Cu,Cl films, produced in a new manner, are discussed. The manufacturing method allowed an improvement in the electro luminescent characteristics of these films. Author

N74-25777# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MEASUREMENT OF SMALL TEMPERATURE VARIATIONS BY MEANS OF ELECTRONIC BRIDGES
N. V. Pilipenko Nov. 1973 4 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Priborostr. (Leningrad), v. 15, no. 4, 1972 p 111-112
(NTC-74-11948; Rept-73-21) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A circuit for switching temperature transducers is presented which is based on the polarized relay RP-7, and is applicable to a recording multipoint electronic bridge, such as KSM-2, with a resistance thermometer having R sub T equal to 59 ohms. The modified electronic bridge allows the recording and measuring of temperatures within the range from 0 to 40 C for the 4 C scale division, and absolute errors less than 0.04 C. Author

N74-25778# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
IDENTIFICATION AND SYNTHESIS OF TIME DISCRETE AND CONTINUOUS SYSTEMS IN THE TIME DOMAIN (DIGITAL FILTER 2) [IDENTIFIKATION UND SYNTHESE VON ZEIT-DISKRETEN UND -KONTINUIERLICHEN SYSTEMEN IM ZEITBEREICH (DIGITALFILTER 2)]
Arild Lacroix Apr. 1972 15 p refs In GERMAN
(IND-FB-38) Avail: NTIS HC $4.00

Two methods for the identification and synthesis of time discrete and continuous systems in the time domain for an assumed mathematical model (broken rational transfer function) are compared. The problem of automatic structure determination is mentioned. An example is given to illustrate both methods. ESRO

N74-25779# Purdue Research Foundation, Lafayette, Ind.
CONDUCTION MECHANISMS IN THICK FILM MICROCIRCUITS Semiannual Technical Report, 1 Jul. - 31 Dec. 1973
R. W. Vest 1 Feb 1974 49 p refs
(Grant DAHC15-73-G-0008; ARPA Order 1001)

(AD-775639) Avail: NTIS CSCL 09/5

The primary thrust of the experimental program is to relate electrical properties of the thick films to the materials properties and processing conditions through microstructure. The materials properties to be correlated are: resistivity, temperature coefficient of resistivity, coefficient of thermal expansion, interfacial energy, particle shape, size and size distribution, and chemical reactivity with other constituents. The processing conditions to be correlated are time, temperature and atmosphere during firing. The specific objectives of the program are to determine the dominant sintering mechanisms responsible for microstructure development and establish the relative importance of the various properties of the ingredient materials, determine the dominant mechanisms limiting electrical charge transport, and establish the relative importance of the various properties of the ingredient materials, and develop phenomenological models to interrelate the various materials properties with systems performance. GRA

N74-25780# Naval Research Lab., Washington, D.C.
ELECTRONIC SURFACE STUDIES OF VACUUM-INTEGRATED-CIRCUIT COMPONENTS Final Report
Henry F. Gray and George A. Haas 21 Dec. 1973 17 p refs
(NRL Proj. R08-58)
(AD-775588; NRL-7641) Avail: NTIS CSCL 09/5

Microelectronic vacuum-integrated-circuit components were studied to determine the emission capability of an electron emitter which is necessary for vacuum-integrated circuit operation, to determine the surface-potential variations on the cathode and grid structures, and to determine the effects of migration, transport, and diffusion. The emission performance of the electron emitter, which was delineated into small areas of almost any desirable shape by standard photolithographic processes was found to be comparable to standard sprayed oxide-coated cathodes, i.e., the effective work function Phi sub E (1000)K is approximately equal to 1.66 plus or minus 0.50 e/V and Delta Phi sub E/Delta Tau approximately equal to .63 eV/K. Using a scanning low energy probe (SLEEP) and Auger spectrometer, variations in surface potential on electron emitters and electrodes were correlated with chemical element variations. Decreased resistance between electrodes after cathode activation was correlated with the presence of deposited barium and carbon components. Author

N74-25781# Boeing Co., Seattle, Wash.
A STUDY OF ELECTRONICS RADIATION HARDNESS ASSURANCE TECHNIQUES. VOLUME 3: LOT SAMPLING AND IRRADIATE-AND-ANNEAL Final Report, 31 Jul. 1970 - 16 Jul. 1973
I. Arimura Jan. 1974 200 p refs
(Contract F29601-71-C-0001; AF Proj. 8809; AF Proj. 133B)
(AD-776027; AFWL-TR-73-134-Vol-3) Avail: NTIS CSCL 09/3

The program determined physical failure modes of a range of discrete and integrated semiconductor devices exposed to ionizing rate, neutron, and total dose environments. The efficacy of lot sample radiation testing was evaluated using transistors with traceability as far back as wafer position. In addition to studing homogeneity at a wafer level and between wafers, the variability between diffusion runs was assessed. Base transit time normalization for the low-power transistors reduced the measured variability in neutron damage across the wafers, and betwen diffusion lots. This result establishes the existence of a reasonable degree of homogeneity for the low-power devices studied. Inhomogeneity of surface effects at wafer and diffusion levels was established for the transistors used in this task. Irradiate-anneal, IRAN, for parts subjected to neutron and total dose environments was evaluated. Neutron IRAN for the power transistor was found to be an effective technique as determined by the predictability of the neutron induced gain degradation. otal dose IRAN was effective for the op amp used, butt inadequate for the sense amp which was extremely hard. (Modified author abstract) GRA

N74-25782# Northeastern Univ., Boston, Mass.
INVESTIGATION AND DESIGN OF ELECTRONIC CIRCUITRY RELATED TO NOISE AND RADIATION EFFECTS FOR SOLID STATE DEVICES AND CIRCUITS Final Report, 1 Nov. 1970 - 31 Oct. 1973
Basil L. Cochrun, Peter C. Salmon, John Clark, and Paul T. Greiling 1 Dec. 1973 42 p refs
(Contract F19628-71-C-0052; AF Proj. 5621)
(AD-776064; AFCRL-TR-74-0058) Avail: NTIS CSCL 09/5

The report covers investigations of the problems of noise as related to devices and/or circuits and the design of noise reduction circuits. Two methods are described for coping with noise pulses associated with detector post amplifiers. One approach is to gate off the post amplifier. The other approach involves elimination of the noise pulse using a cancellation technique. An improved gating circuit, over that using MOS-FET's, uses Operational Transconductance Amplifiers, OTA's. Analog delays for processing purposes use MFD active filters having low sensitivity factors for passive components. An optical signal and random noise source was designed for noise-signal simulation. The edge effect associated with Schottky-Barrier diodes was investigated and a phenomenological theory proposed by planar theory. Included is a brief study of the effects of radiation on IMPATT diode characteristics. Author (GRA)

N74-25783# Illinois Univ., Urbana. Coordinated Science Lab.
COMPUTER-AIDED DESIGN OF MICROWAVE CIRCUITS Ph.D. Thesis
Edgar Sanchez-Sinencio Aug. 1973 71 p refs
(Contract DAAB07-72-C-0259; Grant NSF GK-31633)
(AD-775637; R-617; UILU-ENG-73-2219) Avail: NTIS CSCL 09/5

The thesis discusses a computer program for the analysis and design of distributed-lumped circuits, including microwave integrated circuits. It is capable of frequency domain analysis, optimization of transducer power gain, reflection coefficient, and/or noise figure. Also, the program can compute the return difference with respect to any admittance parameter so that the stability of the circuit can be determined by the Nyquist criterion. The program handles complex impedances, resistors, capacitors, inductors, transmission lines, independent current sources and grounded voltage sources, voltage controlled current sources, and multiport elements, such as, transistors and circulators, described by their scattering or admittance parameters. It contains a free-format input. (Modified author abstract) GRA

N74-25784# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
CONVERGENT IDENTIFICATION ALGORITHMS
Joseph Perl, Daniel D. Graupe, and Louis L. Scharf 1 Mar. 1974 134 p refs
(Contract N00014-67-A-0299-0019)
(AD-775868; TR-5) Avail: NTIS CSCL 12/1

A least-squares algorithm is derived for memoryless system identification. Then a stochastic approximation algorithm is developed for identifying mixed auto regressive moving average (ARMA) processes. Since the correct auto regressive (AR) model is in general of infinite order, errors appear in an otherwise consistent estimation procedure. Upper bounds of these errors are developed for the ARMA parameters and for the Kalman-Bucy filter based on these identified parameters. Finally, an adaptive array estimation algorithm is developed for the case of correlated signal and noise fields and shown to converge in mean-square. (Modified author abstract) GRA

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-25785+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
BIBLIOGRAPHY ON HYPERSONIC WIND TUNNELS, 1963-1972
Mar. 1974 63 p refs
(NAL-Bibl-Sero-53) Avail NTIS HC $6.25

Documents concerning aspects of apparatus and facilities for hypersonic wind tunnels are listed. The bibliography cites 492 references. A.A.D.

N74-25786# Bureau of Mines, Twin Cities, Minn. Metallurgy Research Center.
RAPID PARTICLE SIZE ANALYSIS BY HYDROSIZING AND NUCLEAR SENSING
C. B. Daellenbach, W. M. Mahan, and F. E. Armstrong 1974 19 p refs
(BM-RI-7879) Avail: NTIS HC $4.00 CSCL 14B

A prototype particulate size analyzer system was developed that would rapidly determine size distributions of homogeneous and two-mineral materials in the 74-micrometer (200-mesh) to 7-micrometer size range. The system sizes particles in a series of hydrocyclone elutriation steps and senses the weight of the five sized fractions by nuclear attenuation techniques. Size distribution of materials was determined from experimentally developed mathematical relationships that existed between particulate weight and the measured transmittance of gamma rays from an Americium-241 source. Author

N74-25787*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MISSION AND SPACECRAFT SUPPORT FUNCTIONS OF THE MATERIALS ENGINEERING BRANCH: A SPACE ORIENTED TECHNOLOGY RESOURCE
Aaron Fisher and Charles L. Staugaitis May 1974 63 p
(NASA-TM-X-70663; X-755-74-152) Avail: NTIS HC $6.25 CSCL 14B

The capabilities of the Materials Engineering Branch (MEB) of the Goddard Space Flight Center, Greenbelt, Maryland, are surveyed. The specific functions of spacecraft materials review, materials processing and information dissemination, and laboratory support, are outlined in the Activity Report. Further detail is provided by case histories of laboratory satellite support and equipment. Project support statistics are shown, and complete listings of MEB publications, patents, and tech briefs are included. MEB staff, and their respective discipline areas and spacecraft liaison associations, are listed. A.A.D.

N74-25788*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
OPERATING CHARACTERISTICS OF THE LANGLEY MACH 10 HIGH REYNOLDS NUMBER HELIUM TUNNEL
Ralph D. Watson, Dana J. Morris, and Michael C. Fischer Washington Jun. 1974 41 p refs
(NASA-TM-X-2955; L-9259) Avail: NTIS HC $3.25 CSCL 14B

Operating characteristics of the Langley Mach 10 high Reynolds number helium tunnel are presented for stagnation pressures from 138 N/sq cm to 1655 N/sq cm. The characteristics include detailed Mach number surveys in the test section from which usable core size and regions of disturbed flow were determined, preliminary blockage test results, and maximum run time to be expected at various stagnation pressures. Important tunnel dimensions including details of the model mounting apparatus are given. Measurements show the variation in average core Mach number in the test section to be between 9.4 and 10 for the present range of test conditions. The core radius is from 23 cm to 31.5 cm, depending on stagnation pressure and axial location in the test section. Author

N74-25789*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NASA LEWIS 8 BY 6 FOOT SUPERSONIC WIND TUNNEL
Robert J. Swallow and Robert A. Aiello May 1974 24 p refs
(NASA-TM-X-71542; E-7949) Avail: NTIS HC $3.00 CSCL 14B

Performance data are presented for the tunnel, which has a Mach number range from 0.36 to 2.0. The tunnel circuit, test section, model support systems, auxiliary systems, instrumentation, control room equipment, and automatic recording and computing equipment are also described. Information is presented on criteria for designing models and on shop facilities available to prospective users. Author

N74-25790# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
FREE JET ENGINE TESTING: WIND TUNNEL STARTING
Paul J. Ortwerth Dec. 1973 33 p refs
(AF Proj. 3012)
(AD-776318; AFAPL-TR-73-105) Avail: NTIS CSCL 14/2

Free jet wind tunnels are used extensively for jet engine testing and development. A facility diffuser is employed for altitude simulation. Diffuser size and performance must be matched to the exhauster pumping capacity and engine installation drag or diffuser unstarts will occur. The diffuser starting theory of Rudolf Herman was reviewed and extended to determine the allowable drag coefficient of ramjet test installations in free jet wind tunnels. Specific drag limits are calculated for the Air Force free jet test stand located at The Marquardt Corporation, Van Nuys, California. Author (GRA)

N74-25791# ARO, Inc., Arnold Air Force Station, Tenn.
EVALUATION OF A WIND TUNNEL TECHNIQUE TO DETERMINE AIRCRAFT DEPARTURE CHARACTERISTICS Final Report, 2 Feb. - 18 May 1973
R. W. Bulter AEDC Mar. 1974 29 p refs
(AD-776317; ARO-PWT-TR-73-121; AEDC-TR-73-183) Avail: NTIS CSCL 14/2

A wind tunnel pilot test was conducted to develop a captive aircraft testing technique. By utilizing wind tunnel research to determine the static aerodynamic forces and moments in conjunction with an on-line digital computer programmed with the equations of motion, a series of aircraft stall/departure type maneuvers was generated. A 1/72-scale A-7D aircraft model was utilized. All maneuvers were initiated at Mach number 0.50 at a simulated altitude of 20,000 ft. (Modified author abstract) GRA

N74-25792# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
ENGINEER DESIGN TEST OF HEAVY-DUTY MEMBRANE AIRFIELD SURFACING Final Report, May 1970 - May 1972
Frank M. Palmer Feb. 1974 100 p refs
(DA Proj. 1G7-64717-DH-01)
(AD-776331; AEWES-TR-S-74-2) Avail: NTIS CSCL 01/5

Tests were conducted to determine the suitability of heavy-duty airfield surfacing and accessories as expedient membrane surfacing for waterproofing and dustproofing hastily prepared airfields for operations of C-130 aircraft. The objectives of the tests were to compare the heavy-duty membrane with the WX18 membrane, and to determine through laboratory and field tests whether the heavy-duty membrane met the requirements of the Department of the Army approved Qualitative Materiel Requirement (QMR) for Prefabricated Airfield Surfacings. (Modified author abstract) GRA

N74-25873 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC STATIONS IN ANTARCTICA (1972)
L. I. Dubrovin and A. T. Makushina *In its* Selected Transl. from Bull. of the Soviet Antarctic Expedition (JPRS-62019) 17 May 1974 p 13-17 Transl. into ENGLISH from Inform. Byul. Sov. Antarkt Expeditsii (Leningrad), no. 87, 1973 p 21-24 (For availability see N74-25871 15-13)

N74-25944 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
GROUND-BASED EQUIPMENT
O. Weber *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 11 p refs (For availability see N74-25933 15-14)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-25793 Maryland Univ., College Park.

INTERACTION OF A THREE-DIMENSIONAL FLUID JET WITH A NEARBY WALL BOUNDARY Ph.D. Thesis

Stephen Sacks 1973 99 p
Avail: Univ. Microfilms Order No. 74-9828

An experimental investigation is made of the attachment to a nearby wall boundary of a turbulent, incompressible, air-jet issuing from a rectangular nozzle exit into ambient air. A numerical model of the problem is also developed. Experiments are described for nozzles with various exit dimensions with the nozzle major axis located at heights from one to six inches above the wall boundary. Exit velocity is approximately 100 ft./sec. The preattachment interaction region between the jet and the bounding surface is found to be dominated by a significant crossflow from the sides. This is in contrast to the two-dimensional case where a reverse flow-vortex forms in the preattachment region. An approximate analysis of the problem is obtained by assuming a one-dimensional crossflow at each preattachment location. Dissert. Abstr.

N74-25794 California Univ., Los Angeles.

TRANSONIC CONICAL FLOW Ph.D. Thesis

Kaloust Gregory Agopian 1973 80 p
Avail: Univ. Microfilms Order No. 74-11488

The problem of inviscid, steady transonic conical flow formulated in terms of the small disturbance theory is studied. The small disturbance equation and similarity rules are presented, and a boundary value problem is formulated for the case of a supersonic freestream Mach number. The equation for the perturbation potential is solved numerically using an elliptic finite difference system. The difference equations are solved with a point relaxation algorithm that is also capable of capturing the shock wave during the iteration precedure by using the boundary conditions at the shock. Numerical calculations, for shock location, pressure distribution and drag coefficient, are presented for nonlifting conical wings of circular and rhombic cross sections. The theory of slender wings is also presented and analytical results for pressure and drag coefficients are obtained. Dissert. Abstr.

N74-25795 Missouri Univ., Columbia.

DOWNSTREAM CONTROL OF JET ATTACHMENT SWITCHING Ph.D. Thesis

Ho-Ping Lin 1973 154 p
Avail: Univ. Microfilms Order No. 74-9959

Main jet distances and switching in a downstream control jet is investigated. Models were designed to predict the jet attachment distance of confined jets for the cases of laminar flow, turbulent flow, and combined flow of two jets for the assumptions of two-dimensional, incompressible, steady state flows. Air is the fluid for all the experimental tests. In the experimental study of jet switching, the main jet attachment is shifted from one wall to the other by a control jet flow. The switching times for different sets of values of flow rate ratios and control jet directions are also reported in this paper. Dissert. Abstr.

N74-25796+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.

BASE FLOW: A BIBLIOGRAPHY, 1950-1972

Oct. 1973 147 p refs
(NAL-Bibl-Ser-46) Avail: NTIS HC $10.50

A literature search of all aspects of base flow structure, base pressure, and base drag was conducted. The scope of base flow includes all models of axisymmetric, nonsymmetric, two dimensional and three dimensional flow at all flow regimes in the supersonic, transonic, hypersonic, and subsonic classes. The subjects include: (1) base pressure fluctuation, (2) base flow structure, and (3) the effects of jet, sting, fins, and base bleed on flow characteristics. Experimental techniques for base flow investigation and computation of base flow problems are described. Author

N74-25797 Illinois Univ., Chicago.

REDUCTION OF TURBULENT ENERGY AND SHEAR BY PARTICULATES IN A HOMOLOGOUS TURBULENT SHEAR FLOW FIELD OF LOW REYNOLDS NUMBER Ph.D. Thesis

Pericles Spyros Koronakis 1973 189 p
Avail: Univ. Microfilms Order No. 74-10380

A theoretical explanation for the phenomenon of frictional drag reduction by dilute particulate suspensions in a turbulent fluid field was developed. Although no boundary layer or pipe flow was considered, the development and final results of the present turbulent flow analysis clearly show the manner in which the turbulent energy and drag are affected without the complexity and unresolved difficulties encountered with a suspension type-turbulent boundary layer flow. Analytically, a theory simplified by Stokesian drag and low turbulence Reynolds number has been developed. Furthermore, assumptions of dilute concentrations and nearly neutrally buoyant suspensions simplified the governing equations and largely reduced the computer time needed. The developed theory was applied to two types of turbulent flows, isotropic and homologous (which is defined geneous turbulent flow). Dissert. Abstr.

N74-25798 Minnesota Univ., Minneapolis.

CONVECTIVE INSTABILITY IN SUPERPOSED POROUS AND FREE LAYERS Ph.D. Thesis

Wann-Joe Sun 1973 196 p
Avail: Univ. Microfilms Order No. 74-10597

Thermal convection between a fluid filled porous layer and a pure fluid layer heated from below and cooled from above is investigated. The region of the onset of convection is predicted by theoretical analysis where the critical Rayleigh number is determined for the linear case. Consideration is also given to a variety of the thermal and hydrodynamic conditions at the surfaces which bound the layers. The physical parameters such as layer depth ratio, porosity, diffusivity, permeability, density, slip coefficient, and heat capacity are studied in detail. The perturbation theory for the bifurcating solutions which arise in the variational theory for turbulent heat transport across a fluid filled porous layer heated from below is also studied in detail. Dissert. Abstr.

N74-25799 Tennessee Univ., Knoxville.

SECOND-ORDER FLOW FIELDS OF SLENDER BODIES OF REVOLUTION AT HIGH SUPERSONIC SPEEDS Ph.D. Thesis

Kong-teng Wang 1973 73 p
Avail: Univ. Microfilms Order No. 74-11296

A theoretical investigation of the second-order flow field of slender bodies of revolution at high supersonic speed is presented. Extensions to the current sonic boom theories are studied. In the linearized theory, Whitham's F-function is used to obtain the complete first-order characteristics equation. Improved shock positions and pressure signatures are calculated and are compared to some other previous works. For bodies with slope discontinuities, the F-function on the axis is carefully examined. Solutions of the second-order supersonic flow field are also developed. Approximations to the second-order perturbation velocities are expressed by first-order solutions. Characteristics are corrected to the second-order flow disturbances. Shock positions are determined either by the second-order bisecting rule or by the oblique shock relations. Dissert. Abstr.

N74-25800*# National Aerospace Lab., Tokyo (Japan).

TIME-RESOLVED SPECTROSCOPIC MEASUREMENTS BEHIND INCIDENT AND REFLECTED SHOCK WAVES IN AIR AND XENON

Takashi Yoshinaga Dec. 1973 19 p refs
(Grants NGR-36-008-163; AF-AFOSR-1759-69)
(NASA-CR-138472; NAL-TR-351R) Avail: NTIS HC $4.00 CSCL 20D

Time-resolved spectra have been obtained behind incident and reflected shock waves in air and xenon at initial pressures of 0.1 and 1.0 torr using a rotating drum spectrograph and the OSU (The Ohio State University) arc-driven shock tube. These spectra were used to determine the qualitative nature of the flow as well as for making estimates of the available test time. The (n+1,n) and (n,n) band spectra of $N_2(+)$ (1st negative) were observed in the test gas behind incident shock waves in air at $p_1 = 1.0$ torr and $U_s = 9\text{-}10$ km/sec. Behind reflected shock waves in air, the continuum of spectra appeared to cover almost the entire wavelength of 2,500-7,000 A for the shock-heated test gas. For xenon, the spectra for the incident shock wave cases for $p_1 = 0.1$ torr show an interesting structure in which two intensely bright regions are witnessed in the time direction. The spectra obtained behind reflected shock waves in xenon were also dominated by continuum radiation but included strong absorption spectra due to FeI and FeII from the moment the reflected shock passed and on. Author

N74-25801*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

ASTP FLUID TRANSFER MEASUREMENT EXPERIMENT Final Report

G. L. Fogal Apr. 1974 76 p
(Contract NAS9-13519)
(NASA-CR-134275; GE-74SD4215) Avail: NTIS HC $7.00 CSCL 20D

The ASTP fluid transfer measurement experiment flight system design concept was verified by the demonstration and test of a breadboard model. In addition to the breadboard effort, a conceptual design of the corresponding flight system was generated and a full scale mockup fabricated. A preliminary CEI specification for the flight system was also prepared. Author

N74-25802*# Michigan State Univ., East Lansing. Div. of Engineering Research.

THE EFFECT OF EXIT CONDITIONS ON THE DEVELOPMENT OF AN AXISYMMETRIC TURBULENT FREE JET Third Year Technical Report

Stanley J. Kleis and John F. Foss 15 May 1974 213 p refs
(Grant NGR-23-004-068)
(NASA-CR-138468) Avail: NTIS HC $13.75 CSCL 20D

The mean flow in the near field of a submerged axisymmetric jet emitting from a plane wall is presented. An experimental configuration to provide a nearly uniform mean velocity profile with a core of homogeneous turbulence of variable intensity and scale was developed. Eight cases with intensity values of 0.004 less than or equal to U prime less than or equal to 0.035 and integral scales up to l sub x/R = 0.28 were investigated using conditional sampling techniques. It was found that the jet exhibits an increasing momentum flux in the near field. Contrary to expectation and the accepted assumption of ambient static pressure in a turbulent jet, results seem to be conclusive and borne out by comparison with published data. Both integral measures, mass and momentum flux ratios, are insensitive to exit turbulence variations, but, the detailed structure (including centerline velocity) variations with exit conditions are systematic and explainable. Author

N74-25803*# Michigan State Univ., East Lansing. Div. of Engineering Research.

MEASUREMENTS IN A LARGE ANGLE OBLIQUE JET IMPINGEMENT FLOW Third Year Technical Report

John F. Foss Jan. 1974 61 p refs
(Grant NGR-23-004-091)
(NASA-CR-138467) Avail: NTIS HC $6.25 CSCL 20D

Velocity and surface pressure measurements, in the flow field of an obliquely impinging jet, and their interpretation as regards the governing mechanics and the aerodynamic noise generation characteristics of such a flow are reported. A computer controlled probe positioning mechanism allowed the measurement of the velocity magnitude and direction in the plane parallel to the plate. The mean velocity and Reynolds stress components were recorded. Measures of the terms in the momentum equation reveal the character of the pressure gradients in the neighborhood of the stagnation point. The effects of the stagnation streamline location on the vorticity field and the vortex sound considerations are discussed in relationship to the aerodynamic noise generation effects of this flow. Author

N74-25804*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A PROCEDURE FOR CALCULATION OF BOUNDARY LAYER TRIP PROTUBERANCES IN OVEREXPANDED ROCKET NOZZLES

Robert H. Schmucker (National Academy of Sciences - National Research Council) 2 Apr. 1973 35 p refs
(NASA-TM-X-64843) Avail: NTIS HC $3.25 CSCL 20D

A procedure is described for sizing, scaling, positioning and performance loss calculation of a boundary layer trip protuberance. The theoretical results are compared with some experimental data. The application of boundary layer trips, such as secondary injection, wall angle discontinuities, circumferential grooves, and circumferential trip protuberances for reducing side loads on rocket nozzle walls is discussed. Author

N74-25805*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SHOCK POSITION SENSOR FOR SUPERSONIC INLETS Patent Application

Miles O. Dustin, inventor (to NASA) Issued 30 May 1974 14 p
(NASA-Case-LEW-11915-1; US-Patent-Appl-SN-474744) Avail: NTIS HC $4.00 CSCL 01A

Static pressure taps or ports are provided in the throat of a supersonic inlet and signals indicative of the pressure at each of the ports is fed to respective comparators. Means is also provided for directing a signal indicative of the total throat pressure to the comparators. A periodic signal is superimposed on the total throat pressure so that the signal from the static pressure taps is compared to a varying scan signal rather than to total throat pressure only. This type of comparison causes each comparator to provide a pulse width modulated output which may vary from 0 percent time on to 100 percent time on. The pulse width modulated outputs of the comparators are summed, filtered and directed to a controller which operates a bypass valve such as a door whereby air is dumped from the inlet to prevent the shock wave from being expelled out the front. NASA

N74-25806# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.

INTRODUCTION TO LIQUID FLOW METERING AND CALIBRATION OF LIQUID FLOWMETERS Final Report

Lief O. Olsen Jun. 1974 60 p refs Sponsored by DOD, Calibrating Coordination Group
(NBS Proj. 2130467)
(NBS-TN-831) Avail: SOD HC $0.95 as C13.46:831 CSCL 20D

An instruction manual for technicians and engineers engaged in metering liquids and calibrating liquid flowmeters is presented. It is a condensed review of the properties of liquids and the mathematical relations required in this work. References to more complete sources of properties of liquids, theoretical relations and instructions for metering liquids are included. Separate chapters discuss liquids and their properties as they affect flow, the theory of incompressible flow of liquids and the measurements required in the metering of liquids. One chapter describes several different apparatus and their use in the calibration of liquid flowmeters. The last chapter contains brief descriptions of the many types of flowmeters such as differential pressure, positive displacement, electromagnetic and ultrasonic. It also included a discussion of the physical principles involved in their design and use. Author

N74-25807*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAM FOR CALCULATING LAMINAR, TRANSITIONAL, AND TURBULENT BOUNDARY LAYERS FOR A COMPRESSIBLE AXISYMMETRIC FLOW

James A. Albers and John L. Gregg Washington Apr. 1974 174 p refs
(NASA-TN-D-7521; E-7819) Avail: NTIS HC $5.00 CSCL 20D

A finite-difference program is described for calculating the viscous compressible boundary layer flow over either planar or axisymmetric surfaces. The flow may be initially laminar and progress through a transitional zone to fully turbulent flow, or it may remain laminar, depending on the imposed boundary conditions, laws of viscosity, and numerical solution of the momentum and energy equations. The flow may also be forced into a turbulent flow at a chosen spot by the data input. The input may contain the factors of arbitrary Reynolds number, free-stream Mach number, free-stream turbulence, wall heating or cooling, longitudinal wall curvature, wall suction or blowing, and wall roughness. The solution may start from an initial Falkner-Skan similarity profile, an approximate equilibrium turbulent profile, or an initial arbitrary input profile. Author

N74-25808*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

RELAXATION OF AN UNSTEADY TURBULENT BOUNDARY LAYER ON A FLAT PLATE IN AN EXPANSION TUBE

Roop N. Gurta and Robert L. Trimpi Washington Jun. 1974 58 p refs

(NASA-TN-D-7499; L-9168) Avail: NTIS HC $3.75 CSCL 20D

An analysis is presented for the relaxation of a turbulent boundary layer on a semi-infinite flat plate after passage of a shock wave and a trailing driver gas-driven gas interface. The problem has special application to expansion-tube flows. The flow-governing equations have been transformed into the Crocco variables, and a time-similar solution is presented in terms of the dimensionless distance-time variable alpha and the dimensionless velocity variable beta. An eddy-viscosity model, similar to that of time-steady boundary layers, is applied to the inner and outer regions of the boundary layer. A turbulent Prandtl number equal to the molecular Prandtl number is used to relate the turbulent heat flux to the eddy viscosity. The numerical results, obtained by using the Gauss-Seidel line-relaxation method, indicate that a fully turbulent boundary layer relaxes faster to the final steady-state values of heat transfer and skin friction than a laminar boundary layer. The results also give a fairly good estimate of the local skin friction and heat transfer for near steady-flow conditions. Author

N74-25809*# Princeton Univ., N.J.

USE OF MULTIPLE DISCRETE WALL JETS FOR DELAYING BOUNDARY LAYER SEPARATION Final Report

J. D. McLean and H. J. Herring Washington NASA Jun. 1974 76 p refs

(Grant NGL-31-001-074)

(NASA-CR-2389) Avail: NTIS HC $4.00 CSCL 20D

The effectiveness of a spanwise array of small discrete blowing nozzles in preventing separation of a turbulent boundary layer was investigated experimentally. The spacing, axial location, and momentum flux of the nozzles were varied in a systematic way, and overall performance was measured for each combination. Extensive mean velocity profiles were measured for one selected combination. Overall diffusion achieved before separation was correlated successfully with a momentum flux excess parameter, and in terms of this parameter discrete nozzles, when advantageously placed, were found to perform somewhat better than an optimally placed two-dimensional jet slot. Author

N74-25810*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EVALUATION OF ANALYTICAL PROCEDURES FOR PREDICTION OF TURBULENT BOUNDARY LAYERS ON A POROUS WALL

Charles E. Towne Washington Jun. 1974 33 p refs

(NASA-TM-X-3063; E-7635) Avail: NTIS HC $3.25 CSCL 20D

An analytical study has been made to determine how well current boundary layer prediction techniques work when there is mass transfer normal to the wall. The data that were considered in this investigation were for two-dimensional, incompressible, turbulent boundary layers with suction and blowing. Some of the bleed data were taken in an adverse pressure gradient. An integral prediction method was used three different porous wall skin friction relations, in addition to a solid-surface relation for the suction cases. A numerical prediction method was also used. Comparisons were made between theoretical and experimental skin friction coefficients, displacement and momentum thicknesses, and velocity profiles. The integral method with one of the porous wall skin friction laws gave very good agreement with data for most of the cases considered. The use of the solid-surface skin friction law caused the integral to overpredict the effectiveness of the bleed. The numerical techniques also worked well for most of the cases. Author

N74-25811# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.

DISPERSION OF DUST IN A CHANNEL BY A TURBULENT GAS STREAM

C. C. Hwang, J. M. Singer, and T. N. Hartz 1974 32 p refs

(BM-RI-7854) Avail: NTIS HC $4.75

The Bureau of Mines formulated a method for calculating the concentration of entrained dust from a dust deposit by a turbulent gas stream. In particular, a diffusion equation is used to calculate dust concentrations in a channel following an explosion. Dust leaving the channel walls was treated as originating from stationary or moving, and single or multiple material sources. Formulas and sample computations for various types of dust sources in circular and rectangular channels are given, based on experimental entrainment rates. The analysis predicts the dust concentration as a function of time and channel space. The results appear to agree with the physical characteristics of explosion-driven dust dispersion in a 0.6-m-diameter, 50-m-long explosion tunnel. The analysis is also applied to simultaneous and consecutive dispersion of coal and rock dust from simulated coal mine surfaces (walls, floor, roof, and ribs). Author

N74-25812*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

REYNOLDS NUMBER EFFECTS ON BOATTAIL DRAG OF EXHAUST NOZZLES FROM WIND TUNNEL AND FLIGHT TESTS

Fred A. Wilcox and Roger Chamberlin [1974] 27 p refs Proposed for presentation at AGARD Fluid Dyn. Panel Specialists Meeting on Airframe/Propulsion Interference, Rome, 3-6 Sep. 1974

(NASA-TM-X-71548; E-7763) Avail: NTIS HC $3.25 CSCL 20D

A family of nacelle mounted high angle boattail nozzles was tested to investigate Reynolds number effects on drag. The nozzles were flown on a modified F-106B and mounted on scale models of a F-106 in a wind tunnel. A 19- to 1-range of Reynolds number was covered as a result of the large size differences between models and by flying over a range of altitude. In flight, the nozzles were mounted behind J-85 turbojet engines. Jet boundary simulators and a powered turbojet engine simulator were used on the wind tunnel models. Data were taken at Mach numbers of 0.6 and 0.9. Boattail drag was found to be affected by boattail number. The effect is a complex relationship dependent upon boundary layer thickness and nozzle boattail shape. As Reynolds number was increased from the lowest values obtained with scale models, boattail drag first increased to a maximum at the lowest flight Reynolds number and then decreased. Author

N74-25813# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).

FILM COOLING WITH EJECTION FROM A ROW OF INCLINED CIRCULAR HOLES: AN EXPERIMENTAL STUDY FOR THE APPLICATION TO GAS TURBINE BLADES

Christian Liess Mar. 1973 105 p refs

(VKI-TN-97) Avail: NTIS HC $8.25

Film cooling with ejection of the coolant from a row of holes is the only practical way to apply this cooling method to gas turbine blades. A literature survey shows that information on this type of cooling is very limited. Measurements of the adiabatic wall effectiveness and the heat transfer coefficient on a flat plate downstream of a row of ejection holes are described. The effect of the principal flow parameters is studied for ejection of hot air into a cold air main flow. Laterally averaged values are measured for an ejection angle of 35 deg and a spacing diameter ratio of 3. Ejection at a stagnation point is investigated also. The main test conditions, such as main flow Mach numbers, pressure gradients and boundary layer properties are determined according to experiments on a cascade of typical turbine blade profiles. Application of the results to film cooled gas turbine blades is, therefore, possible. Author

N74-25814# National Aeronautical Lab., Bangalore (India).

NEAR WAKE OF A COLD CIRCULAR CYLINDER AT FREE STREAM MACH 6

M. A. Ramaswamy and Toshi Kubota (Calif. Inst. of Tech., Pasadena) Jul. 1972 43 p refs

(NAL-TN-40) Avail: NTIS HC $5.25

Investigation conducted to determine the effect of cooling on the near wake of a two-dimensional circular cylinder. Mean flow properties were determined from Pitot pressure, static pressure, and hot-wire recovery temperature measurements. The base pressure decreased with cooling. The wake shocks, the shear layer edges and the thermal layer edges moved closer to the wake centerline with cooling and with increase in Reynolds number. In the recirculating region, the transverse total temperature distributions exhibited a minimum close to the dividing stream line for all the cases, and the total temperature on the centerline was nearly constant and equal to the value at the rear stagnation point. The existence of a thin thermal layer on the base was evident for the cold models. Author

N74-25815*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MODEL WALL AND RECOVERY TEMPERATURE EFFECTS ON EXPERIMENTAL HEAT TRANSFER DATA ANALYSIS

D. A. Throckmorton and D. R. Stone Jun. 1974 45 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Sep. 1974

(NASA-TM-X-71967) Avail: NTIS HC $5.25 CSCL 20D

Basic analytical procedures are used to illustrate, both qualitatively and quantitatively, the relative impact upon heat transfer data analysis of certain factors which may affect the accuracy of experimental heat transfer data. Inaccurate knowledge of adiabatic wall conditions results in a corresponding inaccuracy in the measured heat transfer coefficient. The magnitude of the resulting error is extreme for data obtained at wall temperatures approaching the adiabatic condition. High model wall temperatures and wall temperature gradients affect the level and distribution of heat transfer to an experimental model. The significance of each of these factors is examined and its impact upon heat transfer data analysis is assessed. Author

N74-25816*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

REACTING VISCOUS-SHOCK-LAYER SOLUTIONS WITH MULTICOMPONENT DIFFUSION AND MASS INJECTION

James N. Moss Washington Jun. 1974 149 p refs

(NASA-TR-R-411; L-8861) Avail: NTIS HC $4.75 CSCL 20D

Numerical solutions of the viscous-shock-layer equation where the chemistry is treated as being either frozen, equilibrium, or nonequilibrium are presented. Also the effects of the diffusion model, surface catalysis, and mass injection on surface transport and flow parameters are considered. The flow is treated as a mixture of five inert and thermally perfect species. The viscous-shock-layer equations are solved by using an implicit-difference scheme. All calculations are for hyperboloids with included angles of 20 and 45. The flight conditions are those for various altitudes and velocities in the earth's atmosphere. Data are presented to show the effects of the chemical models; diffusion models; surface catalysis; and mass injection of air on heat transfer; skin friction; shock standoff distance; wall pressure distribution; and tangential velocity, temperature, and species profiles. The results show that an equilibrium analysis can substantially overpredict the heat-transfer rates for flow conditions experienced by earth-orbital entry vehicles. Moreover, at such conditions surface catalysis significantly influences heat-transfer and flow-field properties. If a binary rather than a multicomponent diffusion model is assumed, negligible errors in most flow properties result. Quantitative results are presented that show the effect of mass injection on flow properties within and downstream of the injection region. Author

N74-25817# Oxford Univ. (England). Dept. of Engineering Science.

THE OXFORD UNIVERSITY WATER CAVITATION TUNNEL AND ITS USE TO STUDY THE EFFECTS OF CAVITATION ON A JET FLAPPED HYDROFOIL

A. B. Bailey 1974 263 p refs Sponsored in part by Sci. Res. Council

(Contract SN/1057/014/NPL)

(Rept-1080/74) Avail: NTIS HC $16.25

The work necessary to recreate a water cavitation tunnel from an incomplete collection of components is described. An air entrainment problem which had been introduced by a modification to the tunnel circuit, was examined and a description is then given of the physical task of erection and commissioning of the tunnel. An account is given of the instrumentation system, together with its standardization and the calibration equipment necessary to ensure an adequate standard of accuracy. The tunnel systems are described in some detail and step-by-step instructions for operating and maintaining the equipment are provided. A number of worthwhile improvements deemed necessary in the light of subsequent operational experience are listed. A study of the effects of cavitation on a jet flapped hydrofoil using the tunnel is then made. The hydrodynamic and mechanical design of the model hydrofoil is detailed and test data taken under cavitating and non-cavitating conditions is compared with existing aerodynamic data. Results are discussed and general comments made on the investigation together with specific recommendations for its continuation. Author (ESRO)

N74-25818# Defence Research Information Centre, Orpington (England).

THE MECHANISM OF FORMATION OF A DROPLET BED AT A LIQUID-LIQUID INTERFACE

Mitsunori Hosozawa Jan. 1974 15 p refs Transl. into ENGLISH from Kagaku Kogaku, v. 37, no. 3, 1973 p 402-408 Presented at the 34th Ann. Conf. of the Soc. of Chem. Engr. of Japan, Tokyo, 2 Apr. 1969

(DRIC-Trans-3507; BR30850) Avail: NTIS HC $4.00

The mechanism of droplet bed formation in a liquid-liquid system was modelized by using the theory of queueing and this was compared with experimental results. A relatively satisfactory explanation of the observed values was made by using a model for a proportional frequency of droplet coalescence in a droplet bed with droplet diameter. It seems possible to estimate the queueing time for the coalescence of droplets in a bed from the measurement of queueing time for the coalescence of single droplets on a flat surface. Author (ESRO)

N74-25819# Adviesbureau der Genie, The Hague (Netherlands).

PROTECTION AGAINST EXPLOSION CALAMITIES BY AIR EXHAUST SYSTEMS [BEVEILIGING DOOR AFBLAASINRICHTINGEN TEGEN EXPLOSIEGEVAAR]

W. VanEngelenburg Nov. 1973 21 p refs In DUTCH

(Rept-240; TDCK-63701) Avail: NTIS HC $4.25

The problem of sufficient protection against explosion (calamities) in closed compartments by means of an air exhaust system is discussed. An explosion in a closed compartment filled with gas builds up a general overpressure, possibly after the explosion has started with a shock wave. The build-up gains momentum as the already attained pressure increases. The general overpressure can be decreased by venting the gas through an exhaust aperture, opening only when a critical overpressure is reached. The conditions under which this exhaust aperture provides sufficient protection against explosion calamities were studied. ESRO

N74-25820# European Space Research Organization, Paris (France).

A METHOD OF CHARACTERISTICS FOR THREE-DIMENSIONAL, STEADY SUPERSONIC FLOW IN ROTATING AND STATIONARY ANNULAR CASCADES

H. H. Fruehauf Apr. 1974 92 p refs Transl. into ENGLISH of Ein Charakteristikverfahren fuer die dreidimensionale, stationaere Ueberschallstroemung in rotierenden und feststehenden Ringgittern, DLR-FB-73-12, DFVLR, 1973

(ESRO-TT-44; DLR-FB-73-12) Avail: NTIS HC $7.75; DFVLR, Porz, West Ger. 32.10 DM

The steady, continuous supersonic flow in rotating stationary annular cascades was treated by a nonlinear, stable method of characteristics in three independent variables. The quasi linear differential equations of the flow were transformed to arbitrary, curvilinear coordinates before being reduced to a characteristics form. The mathematical description of the spatial, oblique-angled characteristic net in annular cascades with arbitrary, smooth boundaries becomes simple. Numerical examples indicate three-dimensional effects which cannot be determined using quasi-three-dimensional approximation methods. The quantitative difference between an approximate solution and the exact, three-dimensional solution is presented for the case of a particular rotating cascade. Author (ESRO)

N74-25821# Naval Ship Research and Development Center, Bethesda, Md.

VIBRATORY DYNAMICS OF FLOW-EXCITED STRUTS IN WATER Final Report

William K. Blake and Lawrence J. Maga Dec. 1973 75 p refs
(SF35452)
(AD-775624; NSRDC-4087) Avail: NTIS CSCL 13/10

The general problem of the response of a cantilevered beam to flow over its surface is considered experimentally and theoretically. The measured flow induced modal vibratory motion of a nonsinging beam is compared to theoretical estimates of inflow turbulence excitation and boundary-layer excitation. The comparison indicates that while the response to turbulent inflow is dominant at low frequencies, the response of the strut to its own boundary layer is important at high frequencies. The magnitude of hydrodynamically induced damping is also characterized experimentally. It is shown that results agree favorably with an approximate expression based on finite-aspect-ratio, unsteady airfoil theory. Loss factors, based on entrained mass, are found to be inversely proportional to a reduced frequency based on the width of the strut and inflow speed. Finally, a wind tunnel study of the statistical properties of the boundary layer formed on the strut is described. (Modified author abstract) GRA

N74-25822# Princeton Univ., N.J. Gas Dynamics Lab.
RESEARCH ON HYPERSONIC AND SUPERSONIC FLOWS Final Report, Sep. 1969 - Jul. 1973
Seymour M. Bogdonoff Wright-Patterson AFB, Ohio ARL Dec. 1973 53 p refs
(Contract F33615-70-C-1244; AF Proj. 7064)
(AD-775695; ARL-73-0179) Avail: NTIS

A series of basic research programs of fundamental application to hypersonic and supersonic flight made use of a series of unique hypersonic facilities, including several helium and nitrogen hypersonic wind tunnels covering a range of Mach numbers from about 8 to 25 and simulated altitude conditions up to 350,000 feet. These facilities were supplemented by a newly developed capability to study supersonic flows at the very high Reynolds numbers of full scale flight. The research program was both theoretical and experimental and initially concentrated on hypersonic flows and laminar boundary layers. (Modified author abstract) GRA

N74-25823# Tennessee Univ., Tullahoma. Space Inst.
A THEORY FOR SUBSONIC AND TRANSONIC FLOW OVER A CONE WITH OR WITHOUT SMALL YAW ANGLE
Jain Ming Wu and Robert C. Lock Dec. 1973 85 p refs
(Contract DAAH01-71-C-1078; DA Proj. 1M2-62303-A-214)
(AD-776374; RD-74-2) Avail: NTIS CSCL 16/3

The primary purpose was to develop an accurate method of calculating the surface pressure distribution over a conical forebody for a wide range of free-stream Mach numbers including subsonic, transonic, and low supersonic flow. The theoretical approach used was similar to one previously proposed by Wu and Aoyama. The nondimensionalized small disturbance transonic flow equation was linearized to a variable coefficient elliptic form. A transformation was introduced to further reduce the governing equation to a Laplace form, which yields an integral equation for the transformation function. A first-order solution was obtained by an iterative procedure. The effect due to the small angle of attack has been included by adding the linearized cross flow contribution. (Modified author abstract) GRA

N74-25824# Army Foreign Science and Technology Center, Charlottesville, Va.
ADIABATIC SURFACE TEMPERATURE IN A VORTEX BOUNDARY LAYER
M. G. Morozov 3 Dec. 1974 9 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Moscow), v. 20, May 1971 p 903-908
(AD-776559; FSTC-HT-23-2077-72) Avail: NTIS CSCL 20/4

Calculation of temperature reduction of the adiabatic surface in a supersonic, turbulent boundary layer was carried out. It was shown that the temperature reduction is a consequence of the appearance of a chain of vortices in the boundary flow. Comparison of calculated and experimental data gives qualitative agreement. GRA

N74-25825# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
FURTHER APPLICATIONS OF HOT-WIRE ANEMOMETRY TO TURBULENCE MEASUREMENTS IN HELIUM-AIR MIXTURES
Richard A. Stanford and Paul A. Libby Jan. 1974 45 p refs
Prepared in cooperation with Calif. Univ., La Jolla
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-776613; SQUID-TR-UCSD-5-PU) Avail: NTIS CSCL 20/4

The extension of the Way-Libby probe to permit the measurement of two velocity components, u and v, in the usual notation, and the mass fraction, c, of helium in turbulent flows involving helium-air mixtures is described. The accuracy of the technique, especially the sensitivity to flow deflection is carefully assessed. Results obtained in applying the new probe show, inter alia, highly skewed probability density functions of helium concentration in an internal flow. Author (GRA)

N74-25826# Dayton Univ. Research Inst., Ohio. Research Inst.
ERROR BOUNDS FOR LAMINAR BOUNDARY LAYER SOLUTIONS Final Report, 1 Dec. 1971 - 30 Nov. 1973
Jack G. Crouch Dec. 1973 56 p refs
(Contract F33615-72-C-1412; AF Proj. 7071)
(AD-776772; ARL-73-0193) Avail: NTIS CSCL 20/4

The research is concerned with determining error bounds for approximate solutions of the Prandtl boundary layer equations. The error bounds are determined by applying the theory of differential inequalities. The approximate solutions are of the weighted-residual type and the boundary layer cases studied include both similar and nonsimilar, two-dimensional laminar, incompressible, steady flows. (Modified author abstract) GRA

N74-25827# Harry Diamond Labs., Washington, D.C.
ELECTRO-FLUIDIC TRANSDUCTION USING SMALL HEATING COILS IN CAPILLARY PASSAGES
Silas Katz and Elmer Swartz Dec. 1973 19 p refs
(DA Proj. 1T1-61102-A-33B)
(AD-776957; HDL-TM-73-31) Avail: NTIS CSCL 13/7

A new type of electro-fluidic transducer is evaluated, which uses the heat dissipation from an electric coil in a capillary passage to change the viscosity of the fluid passing through the passage. A transfer function for the transducer is developed crudely, and static measurements on two different sized models show good agreement with calculations. The capillary electro-fluidic transducer has high static sensitivity but low bandwidth. Electrical powers of less than 0.100 W may be converted to sizeable fluid signals however, the bandwidth of the transducers tested was only about 1.0 Hz. Author (GRA)

N74-25828# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE EJECTION CAPACITY OF MIXERS WHICH PARTIALLY LIMIT THE JET AND THE FLAME
V. G. Lisienko, V. V. Bondarenko, G. V. Voronov, B. I. Kitaev, N. I. Kokarev, and S. F. Aleksandrov 8 Mar. 1974 10 p refs Transl. into ENGLISH from Teor. Prakt. Szhiganiya Gaza (Leningrad), v. 5, 1972 p 56-59
(AD-776735; FTD-HT-23-870-74) Avail: NTIS CSCL 20/4

The characteristics of ejectors with a collector at the inlet, a mixer chamber length of 6 to 12 calibers, and a diffuser at the outlet are discussed. The dynamic properties of the gas flow in the outlet section of a mixer and the influence on further development of the jet (flame) were investigated. A chart of the dependence of the coefficient of ejection on the distance between the pole of the jet and the outlet section of the mixer is developed. It was determined that the ejection capacity of the mixers depends not only on the ratio of the diameters, but also on the indicated distance between the poles. It was also determined that the ejection capacity of the mixer which partially restricts the jet cannot exceed the inflow of the surrounding medium into the free jet. Author

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-25829 National Marine Fisheries Service, Washington, D.C.
EASTROPAC ATLAS. VOLUME 7: PHYSICAL OCEANOGRAPHIC AND METEOROLOGICAL DATA FROM PRINCIPAL PARTICIPATING SHIPS AND OCEANOGRAPHER THIRD AND FOURTH MONITOR CRUISES, OCTOBER 1967 - JANUARY 1968
Cuthbert M. Love, ed. Jul. 1973 242 p
Avail: SOD HC $4.75

An atlas containing charts that depict the distribution of physical, chemical, and biological oceanographic properties and associated meteorological properties observed during EASTROPAC is presented. The project EASTROPAC was an international cooperative investigation of the eastern Pacific Ocean which was intended to provide data necessary for a more effective use of marine resources of the area, especially tropical tunas, and also to increase knowledge of the ocean circulation, air-sea interaction, and ecology. Methods used to collect and process the data upon which the atlas is based are described. Author

N74-25830 Wisconsin Univ., Madison.
PROCESSING, SIMULATION AND METEOROLOGICAL INTERPRETATION OF SCATTERING FUNCTIONS FROM A RAKE RADAR SYSTEM IN A TROPOSPHERIC SCATTERING CHANNEL Ph. D. Thesis
Yin-Chang Loh 1973 156 p
Avail: Univ. Microfilms Order No. 74-7483

An examination was made of the problems of modeling and simulating the propagation medium of a tropospheric scatter link. Specifically, the detection of turbulent layers within the common volume was dealt with. Turbulent layers are characterized by a possible combination of the following: (1) random spatial variation in the mean drift velocity of the scatterers, (2) random spatial variation in the scattering cross section of the layer, and (3) vertical wind shear associated with the layer. These properties give rise to perturbations in the signature of the layer as compared to an ideal thin homogeneous layer with uniform velocity. The nature and magnitudes of these perturbations are estimated and later on used in the detection process for typical layers. Anomalous signatures due to noise, rain and airplanes are also modeled and simulated leading to techniques to detect and extract their contributions in the scattering function. Two layer detection techniques were also introduced. Dissert. Abstr.

N74-25831 Cornell Univ., Ithaca, N.Y.
INCOHERENT SCATTER STUDIES OF THE LOWER IONOSPHERE AT ARECIBO USING MULTIPLE PULSE TECHNIQUES Ph.D. Thesis
Carlos Jose Zamlutti 1973 228 p
Avail: Univ. Microfilms Order No. 74-10227

E layer incoherent scatter techniques are studied. Multiple pulse techniques are presented with integration time and altitude resolution. A first attempt at nighttime measuring described. Dissert. Abstr.

N74-25832 Case Western Reserve Univ., Cleveland, Ohio.
COMMUNICATION MODEL FOR THE TURBULENT ATMOSPHERE Ph.D. Thesis
Heh-Sen Lin 1973 106 p
Avail: Univ. Microfilms Order No. 74-10805

Channel modeling for the clear turbulent atmosphere is considered. First, the Rytov-approximation propagation theory is extended to cover two-source covariance functions and structure functions, and the degree of coherence for Gaussian beam propagation in a weakly random inhomogeneous medium. Second, by application of the extended Huygens-Fresnel principle, optical wave propagation through the turbulent atmosphere is characterized by a channel impulse response (Green's function). The statistics of the impulse response are obtained (within a limited region of validity) from the two-source Rytov-approximation spherical-wave theory, and they are then used to calculate output-field statistics for extended sources. A detailed comparison is made of direct Rytov-theory and linear-system theory output-field statistics for Gaussian beam propagation. Finally, the linear-system model is used to study the extent of the isoplanatic patch for the turbulent channel. Dissert. Abstr.

N74-25833 California Univ., Los Angeles.
SOME CONSEQUENCES OF THE ABSORPTION OF SOLAR ULTRAVIOLET RADIATION BY ATMOSPHERIC OZONE Ph.D. Thesis
Narasimhan Sundararaman 1973 273 p
Avail: Univ. Microfilms Order No. 74-11576

The consequences of absorption of solar ultraviolet radiation by ozone and molecular oxygen in the earth's upper atmosphere are reported. The basic methodology of calculating the radiative transfer in a planetary atmosphere with Rayleigh scattering and height-dependent ozone absorption is discussed and applied to determine the climatology of the ultraviolet radiation field illuminating the earth's surface. Some predictions are also given on the increased intensities of the ultraviolet radiation that could result from the photochemical destruction of ozone due to engine effluents from high flying aircraft. The atmospheric tidal theory is reviewed and results of a new calculation for the lunar barometric tide are given. Atmospheric tidal generation by heating due to absorption of UV radiation by ozone is calculated including recent observations at mesospheric altitudes. Moreover, tidal generation by absorption of solar infrared radiation by tropospheric water vapor is also studied with longitudinally-dependent water vapor distributions. Dissert. Abstr.

N74-25834 Cornell Univ., New York.
EARTH'S SURFACE AND OUTER GRAVITY FIELD BY BURIED POINT-MASS SETS Ph.D. Thesis
Sadik Mete Nakiboglu 1974 134 p
Avail: Univ. Microfilms Order No. 74-10193

Twenty different point-mass sets composed of 50 to 130 point masses within the level ellipsoid are constructed to represent the gravity field of the earth both on the surface and outside the earth. The point-mass parameters are determined using the method of least squares such that the point-mass sets generate the same gravity disturbance vector field as that of the SAO model on the surface of the earth. The accuracies of the models are tested by comparing the models' fields with that of the SAO model both on the surface and at the altitudes previously stated. The root mean squares of the gravity disturbance magnitudes generated by the models vary from 9.78 to 5.01 milligals on the surface of the earth. Accuracies of the models increase with increasing altitude. A method is developed which would make it possible to improve the point-mass models on a global scale. This method is based on the numerical integration of the equations of motion together with the variational equations of an earth satellite. Dissert. Abstr.

N74-25835 Department of Energy, Mines and Resources, Ottawa (Ontario).
EDITING AND EVALUATING DIGITALLY RECORDED GEOMAGNETIC COMPONENTS AT CANADIAN OBSERVATORIES Publications of the Earth Physics Branch, Volume 44, No. 9
J. M. Delaurier, E. I. Loomer, G. JansenVanBeek, and A. Nandi 1974 11 p refs
Copyright. Avail: Issuing Activity

Automatic magnetic observatory systems (AMOS) incorporating a fluxgate sensor and a proton precession magnetometer are in operation at 10 Canadian observatories. Values of the field (H, D, Z, F) are recorded each minute on digital magnetic tape. Computer programs edit the data and reduce AMOS values to absolute observatory piers. Comparison of AMOS mean hourly values with similar values scaled from RUSKA magnetograms, and other tests, support the adoption of AMOS systems as primary recorders at Canadian observatories. Author

N74-25836+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands).
PHOTOGRAMMETRY, REMOTE SENSING, CARTOGRAPHY, MAPPING: A SELECTED BIBLIOGRAPHY ON LITERATURE AVAILABLE AT THE TDCK

Feb. 1973 26 p refs Partly in ENGLISH; partly in FRENCH; partly in GERMAN; and partly in DUTCH
Avail: NTIS HC $4.50

A selective bibliography has been compiled of literature in the fields of photogrammetry, remote sensing, and mapping. The period covered is 1968 to 1972. ESRO

N74-25837*# National Physical Research Lab., Pretoria (South Africa).
TO ASSESS THE VALUE OF SATELLITE IMAGERY IN RESOURCE EVALUATION ON A NATIONAL SCALE Final Report, Jul. 1972 - Nov. 1973
O. G. Malan, Principal Investigator Nov. 1973 149 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10494; NASA-CR-136898; CSIR-FIS-50) Avail: NTIS HC $10.50 CSCL 08F

The author has identified the following significant results. It has been shown that ERTS imagery, particularly in the form of 1:500,000 scale false color photolithographic prints, can contribute very significantly towards facilitating and accelerating (dramatically, in the case of vegetation) resource surveys and geologic mapping. Fire mapping on a national scale becomes a feasibility, numerous new geologic features, particularly lineaments, have been discovered, land use can be mapped efficiently on a regional scale and degraded areas identified. The first detailed tectonic and geomorphological maps of the Republic of South Africa will be published in the near future mainly owing to the availability of ERTS-1 imagery.

N74-25838*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, May 1974
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League May 1974 12 p ref EREP
(Contract NAS9-13273)
(E74-10511; NASA-CR-138261) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-25839*# Army Coastal Engineering Research Center, Washington, D.C.
AN ERTS-1 STUDY OF COASTAL FEATURES ON THE NORTH CAROLINA COAST Final Report
Dennis W. Berg, Principal Investigator and George H. Miller Oct. 1973 51 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70260-AG)
(E74-10513; NASA-CR-138263) Avail: NTIS HC $5.75 CSCL 08C

There are no author-identified significant results in this report.

N74-25840*# Environmental Research Inst. of Michigan, Ann Arbor.
RECENT ADVANCEMENTS IN INFORMATION EXTRACTION METHODOLOGY AND HARDWARE FOR EARTH RESOURCES SURVEY SYSTEMS
F. J. Thomson, Principal Investigator and J. D. Erickson [1974] 8 p refs ERTS
(Contracts NAS5-21783; NAS1-11979; NAS9-9784; Grant NGR-23-005-552; Contract DAAK02-73-C-0438)
(E74-10515; NASA-CR-138265; ERIM-193300-46-S) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-25841*# Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.
RETRANSMISSION OF WATER RESOURCES DATA USING THE ERTS-1 DATA COLLECTION SYSTEM
R. A. Halliday, Principal Investigator, I. A. Reid, and E. F. Chapman 14 Dec. 1973 15 p refs Presented at the ERTS Principal Investigator's Symp., Washington, D. C., 10-14 Dec. 1973 ERTS
(E74-10516; NASA-CR-138266) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-25842*# Vermont Univ., Burlington. Dept. of Geography.
ENVIRONMENTAL STUDY OF ERTS-1 IMAGERY: LAKE CHAMPLAIN AND VERMONT Final Report
A. O. Lind, Principal Investigator Apr. 1974 92 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21753)
(E74-10517; NASA-CR-138267) Avail: NTIS HC $7.75 CSCL 08H

There are no author-identified significant results in this report.

N74-25843*# Service de la Carte de la Vegetation CNRS, Toulouse (France).
MANAGEMENT OF NATURAL RESOURCES THROUGH AUTOMATIC CARTOGRAPHIC INVENTORY Final Report, Aug. 1972 - Jan. 1974
Paul-Augustin Rey, Yves Gourinard, and Francis Cambou, Principal Investigators May 1974 64 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10518; NASA-CR-138268; Rept-6) Avail: NTIS HC $6.25 CSCL 08B

The author has identified the following significant results. Significant correspondence codes relating ERTS imagery to ground truth from vegetation and geology maps have been established. The use of color equidensity and color composite methods for selecting zones of equal densitometric value on ERTS imagery was perfected. Primary interest of temporal color composite is stressed. A chain of transfer operations from ERTS imagery to the automatic mapping of natural resources was developed.

N74-25844*# Tri-State Regional Planning Commission, New York.
INVESTIGATION OF SKYLAB IMAGERY FOR REGIONAL PLANNING Quarterly Progress Report, 22 Aug. - 31 Dec. 1973
William Harting, Principal Investigator 31 Dec. 1973 1 p EREP
(Contract NAS9-13266)
(E74-10522; NASA-CR-138271; QPR-2) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-25845*# Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
STUDY OF ARCUATE STRUCTURAL TRENDS IN UTAH AND NEVADA USING ERTS-1 IMAGERY Final Report
Mead LeRoy Jensen, Principal Investigator and Martha Ryder Smith 15 Jan. 1974 37 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21883)
(E74-10526; NASA-CR-138275) Avail: NTIS HC $5.00 CSCL 08G

There are no author-identified significant results in this report.

N74-25846*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Apr. 1974
Paul M. Merifield, Principal Investigator 6 May 1974 2 p EREP
(Contract NAS2-7698)

(E74-10528; NASA-CR-138277; MPR-11) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-25847*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Apr. 1974
Irvin J. Sattinger, Principal Investigator 17 May 1974 2 p EREP
(Contract NAS9-13283)
(E74-10529; NASA-CR-138278; ERIM-103300-25-L) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-25848*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 Mar. - 15 May 1974
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 13 May 1974 3 p EREP
(NASA Order T-4106-B)
(E74-10530; NASA-CR-138279; BMPR-11) Avail: NTIS HC $4.00 CSCL 02F

There are no author-identified significant results in this report.

N74-25849*# Delaware Univ., Newark. Coll. of Marine Studies.
INVENTORIES OF DELAWARE'S COASTAL VEGETATION AND LAND-USE UTILIZING DIGITAL PROCESSING OF ERTS-1 IMAGERY Report on Significant Results
V. Klemas, Principal Investigator, D. Bartlett, R. Rogers (Bendix Corp., Ann Arbor, Mich.), and L. Reed (Bendix Corp., Ann Arbor, Mich.) 24 May 1974 2 p ERTS
(Contract NAS5-21837)
(E74-10531; NASA-CR-138280) Avail: NTIS HC $4.00 CSCL 08A

There are no author-identified significant results in this report.

N74-25850*# Delaware Univ., Newark. Coll. of Marine Studies.
CORRELATION OF COASTAL WATER TURBIDITY AND CIRCULATION WITH ERTS-1 AND SKYLAB IMAGERY Report on Significant Results
V. Klemas, Principal Investigator, M. Otley, and R. Rogers (Bendix Corp., Ann Arbor, Mich.) 28 May 1974 2 p ERTS
(Contract NAS5-21837)
(E74-10532; NASA-CR-138281) Avail: NTIS HC $4.00 CSCL 08C

There are no author-identified significant results in this report.

N74-25851*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-30 Apr. 1974
A. G. Mourad and D. M. J. Fubara, Principal Investigators 16 May 1974 21 p refs EREP
(Contract NAS9-13276)
(E74-10533; NASA-CR-138282; PR-14) Avail: NTIS HC $4.25 CSCL 08E

The author has identified the following significant results. An analytical method for geodetic computation of the marine geoid (the geoid in the oceans) from satellite altimetry is developed and validated with data from Skylab mission SL-2. The criteria for achieving accurate scale and orientation of satellite altimetry geoid are shown to require marine geodetic control to offset systematic errors in the orbit (orientation is completely orbit dependent) and the altimeter data.

N74-25852*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Apr. - 10 May 1974
Kenneth J. Savastano, Principal Investigator 10 May 1974 3 p EREP
(NASA Order T-8217-B)
(E74-10534; NASA-CR-138283; MPR-12) Avail: NTIS HC $4.00 CSCL 08A

The author has identified the following significant results. A plot was drawn of the dolphin catch and the water discontinuities observed in the aerial photography. This plot was similar in format to the one made earlier on the white marlin catch relative to the water rips. Neither plot substantiates (as far as white marlin and dolphin are concerned) an opinion held by fishermen that better fishing may be found in the vicinity of the rips. Remotely inferred values for sea surface temperature, chlorophyll-a and turbidity were substituted for sea truth measurements in prediction models developed in previous analysis. Model performance, using the new values, was disappointing.

N74-25853*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Apr. 1974
George A. Maul, Principal Investigator Apr. 1974 2 p EREP
(NASA Order T-4713-B)
(E74-10535; NASA-CR-138284; MR-10) Avail: NTIS HC $4.00 CSCL 08J

There are no author-identified significant results in this report.

N74-25854*# Geological Survey Dept., Lobatse (Botswana).
TO ASSESS THE VALUE OF SATELLITE PHOTOGRAPHS IN RESOURCE EVALUATION ON A NATIONAL SCALE Final Report, Sep. 1972 - Apr. 1974
J. V. Hepworth, Principal Investigator and S. M. Hutton 26 Apr. 1974 39 p refs Sponsored by NASA ERTS
(E74-10536; NASA-CR-138285) Avail: NTIS HC $5.00 CSCL 08F

The author has identified the following significant results. The limit of resolution on ERTS imagery is normally acknowledged to be about 60 miles although very long features such as roads and railways which are often less than 10 miles long are easily detectable. An example is the north-south road and railway from Lobatse to Francistown. Vegetation growth from winter to summer is readily monitored on false color imagery. The limits of government ranches and special farming areas can be quite accurately ascertained from ERTS imagery. Another aspect to which ERTS imagery lends itself is the location and demarcation of bush fires, many of which were seen on the first imagery which was acquired at the end of the cold, dry season. As a whole, MSS 7 offers maximum reflectance contrast among black and white imagery and is the wavelength used most for interpretation.

N74-25855*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-A DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA
Charles Welby, Principal Investigator 8 May 1974 2 p Presented at the 25th Ann. Highway Geol. Symp., Raleigh, N. C., 24 May 1974 ERTS
(Contract NAS5-21732)
(E74-10537; NASA-CR-138286) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-25856*# Geological Survey, Reston, Va.
CARTOGRAPHIC EVALUATION OF SKYLAB-A S-192 SCANNER IMAGES Quarterly Progress Report, 1 Feb. - 30 Apr. 1974
John D. McLaurin, Principal Investigator 30 Apr. 1974 3 p EREP
(NASA Order T-4111-B)

(E74-10538; NASA-CR-138287) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-25857*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Progress Report, 19 Feb. - 19 Apr. 1974
Craig L. Wiegand, Principal Investigator May 1974 11 p ERTS
(NASA Order S-70251-AG)
(E74-10539; NASA-CR-138288; PR-7) Avail: NTIS HC $4.00 CSCL 08M

The author has identified the following significant results. Reflectance of crop residues, that are important in reducing wind and water erosion, was more often different from bare soil in band 4 than in bands 5, 6, or 7. The plant parameters leaf area index, plant population, plant cover, and plant height explained 95.9 percent of the variation in band 7 (reflective infrared) digital counts for cotton and 78.2 percent of the variation in digital counts for the combined crops sorghum and corn; hence, measurable plant parameters explain most of the signal variation recorded for corpland. Leaf area index and plant population are both highly correlated with crop yields; since plant population can be readily measured (or possibly inferred from seeding rates), it is useful measurement for calibrating ERTS-type MSS digital data in terms of yield.

N74-25858*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Apr. 1974
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Apr. 1974 17 p EREP
(Contract NAS9-13273)
(E74-10540; NASA-CR-138289) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-25859*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Feb. - Apr. 1974
Craig L. Wiegand, Principal Investigator May 1974 2 p EREP
(NASA Order T-4105-B)
(E74-10541; NASA-CR-138290; MPR-6) Avail: NTIS HC $4.00 CSCL 08M

There are no author-identified significant results in this report.

N74-25860*# Corps of Engineers, Waltham, Mass.
ERTS-1 DATA USER INVESTIGATION OF THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 14 Feb. - 14 Apr. 1974
Saul Cooper and Paul Bock, Principal Investigators 9 May 1974 4 p ERTS
(NASA Order S-70256-AG)
(E74-10542; NASA-CR-138291) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-25861*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, 7 Feb. - 7 May 1974
David T. Chang, Principal Investigator 10 May 1974 5 p ref EREP
(Contract NAS9-13343)
(E74-10543; NASA-CR-138292; QPR-4) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-25862*# Alaska Univ., Fairbanks. Inst. of Arctic Biology.
PRELIMINARY VEGETATION MAP OF THE ESPENBERG PENINSULA, ALASKA, BASED ON AN EARTH RESOURCES TECHNOLOGY SATELLITE IMAGE Interim Scientific Report
J. H. Anderson, Principal Investigator, Charles H. Racine (North Carolina State Univ.), and Herbert R. Melchior 8 May 1974 26 p refs ERTS
(Contract NAS5-21833)
(E74-10544; NASA-CR-138293) Avail: NTIS HC $4.50 CSCL 08B

There are no author-identified significant results in this report.

N74-25863*# Alaska Univ., Fairbanks. Inst. of Arctic Biology.
A VEGETATION MAP OF AN AREA NEAR FAIRBANKS, ALASKA, BASED ON AN ERTS IMAGE Interim Scientific Report
J. H. Anderson, Principal Investigator 9 May 1974 17 p refs ERTS
(Contract NAS5-21833)
(E74-10545; NASA-CR-138294) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-25864*# Environmental Research Inst. of Michigan, Ann Arbor.
SKYLAB SUPPORT Progress Report, Mar. 1974
Lester V. Manderschied, Jon D. Erickson, Principal Investigators, and Richard F. Nalepka 10 Apr. 1974 2 p Prepared for Michigan State Univ. EREP
(Contract NAS9-13332)
(E74-10548; NASA-CR-138297; ERIM-104600-12-L) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-25865*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Plans and Progress Report, Apr. 1974
Lester V. Manderscheid, Principal Investigator Apr. 1974 4 p ref EREP
(Contract NAS9-13332)
(E74-10549; NASA-CR-138298) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-25866*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Apr. 1974
David L. Tingey, Principal Investigator Apr. 1974 2 p EREP
(Contract NAS9-13303)
(E74-10550; NASA-CR-138299) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-25867*# Corps of Engineers, Waltham, Mass.
NEW ENGLAND RESERVOIR MANAGEMENT Quarterly Progress Report, 23 Jan. - 23 Apr. 1974
Saul Cooper and Duwayne Anderson, Principal Investigators (CRREL) 23 Apr. 1974 4 p EREP
(NASA Order T-4646-B)
(E74-10551; NASA-CR-138300) Avail: NTIS HC $4.00 CSCL 08H

There are no author-identified significant results in this report.

N74-25868*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND AND DETEC-

TION OF FOREST STRESS Progress Report, 1 Mar. - 30 Apr. 1974
Robert C. Heller, Robert C. Aldrich, Richard S. Driscoll, and F. P. Weber, Principal Investigators 24 May 1974 29 p refs
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70251-AG)
(E74-10558; NASA-CR-138448; FS-1-8; PR-8) Avail: NTIS HC $4.50 CSCL 02F

There are no author-identified significant results in this report.

N74-25869*# Faraday Labs., Inc., La Jolla, Calif.
OGO-6 GAS-SURFACE ENERGY TRANSFER EXPERIMENT Final Report, 8 Aug. 1968 - 31 Dec. 1973
D. McKeown, R. S. Dummer, J. M. Bowyer, Jr., and W. E. Corbin, Jr. 31 Dec. 1973 57 p refs
(Contract NAS5-11163)
(NASA-CR-139009; FAR-GF73-013) Avail: NTIS HC $6.00 CSCL 04A

The kinetic energy flux of the upper atmosphere was analyzed using OGO-6 data. Energy transfer between 10 microwatts/sq cm and 0.1 W/sq cm was measured by short-term frequency changes of temperature-sensitive quartz crystals used in the energy transfer probe. The condition of the surfaces was continuously monitored by a quartz crystal microbalance to determine the effect surface contamination had on energy accommodation. Results are given on the computer analysis and laboratory tests performed to optimize the operation of the energy transfer probe. Data are also given on the bombardment of OGO-6 surfaces by high energy particles. The thermoelectrically-cooled quartz crystal microbalance is described in terms of its development and applications. Author

N74-25870# National Environmental Satellite Service, Washington, D.C. Environmental Sciences Group.
AN EVALUATION OF MAY 1971 SATELLITE-DERIVED SEA SURFACE TEMPERATURES FOR THE SOUTHERN HEMISPHERE
P. Krishna Rao Apr. 1974 16 p refs
(NOAA-TR-NESS-69) Avail: SOD HC $0.55

These observations were obtained from the NOAA 1 satellite. The temperatures were subjected to an analysis program, and daily sea surface temperature charts were generated. Examples of a daily and a monthly mean sea surface temperatures chart are shown. Satellite-derived brightness values and sea surface temperature changes were used to construct time-longitude sections over the eastern part of the South Pacific for May 1971 to study the variations in these two parameters. The sea surface temperatures derived from NOAA 1 data showed good agreement with conventional ship data of the National Marine Fisheries Service. Author

N74-25871# Joint Publications Research Service, Arlington, Va.
SELECTED TRANSLATIONS FROM BULLETIN OF THE SOVIET ANTARCTIC EXPEDITION
17 May 1974 31 p refs Transl. into ENGLISH from Inform. Byul. Sov. Antarkt. Ekspeditsii (Leningrad), no. 87, 1973 21 p
(JPRS-62019) Avail: NTIS HC $4.75

Results of investigations conducted by the sixteenth Soviet Antarctic expedition are presented. Data are also given on investigations of the Southern Hemisphere atmosphere by means of contrast level balloons and the tie-in of gravimetric points Mirnyy-Vostok. For individual titles, see N74-25872 through N74-25875.

N74-25872 Joint Publications Research Service, Arlington, Va.
INVESTIGATIONS CONDUCTED BY THE SIXTEENTH SOVIET ANTARCTIC EXPEDITION
I. G. Petrov *In its* Selected Transl. from Bull. of the Soviet Antarctic Expedition (JPRS-62019) 17 May 1974 p 1-12 Transl. into ENGLISH from Inform. Byul. Sov. Antarkt. Ekspeditsii (Leningrad), no. 87, 1973 p 5-13 (For availability see N74-25871 15-13)

Scientific research carried out by the Soviet Antarctic Expedition in the fields of aerometeorology, geophysics, glaciology, oceanography, geodesy, medicine, and biology is reported. Special winter projects cover: (1) multidiscipline station observations at six Antarctic stations, (2) deep drilling of the glacier cover at Vostok station with continuous removal of core and diversified investigations of borehole ice, (3) underwater hydrobiological investigations of Zykov Island, Haswell Archipelago, (4) glaciological observations on the ice dome in the neighborhood of Molodezhnaya and ice research in Alasheyev Gulf, (5) routine support of scientific exploration, fishing, and expeditionary fleets in the waters of the Antarctic ocean, and (6) transformation of the Molodezhnaya station into the Antarctic meteorological center. E.H.W.

N74-25873 Joint Publications Research Service, Arlington, Va.
SCIENTIFIC STATIONS IN ANTARCTICA (1972) c11
L. I. Dubrovin and A. T. Makushina *In its* Selected Transl. from Bull. of the Soviet Antarctic Expedition (JPRS-62019) 17 May 1974 p 13-17 Transl. into ENGLISH from Inform. Byul. Sov. Antarkt Expeditsii (Leningrad), no. 87, 1973 p 21-24 (For availability see N74-25871 15-13)

Special as well as common studies carried out by scientific stations from 10 different countries based in the Antarctic are outlined. Data observed and information about the stations are given in tabular form. E.H.W.

N74-25874 Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF THE SOUTHERN HEMISPHERE ATMOSPHERE BY MEANS OF CONSTANT-LEVEL BALLOONS
A. I. Voskresenskiy and E. P. Lysakov *In its* Selected Transl. from Bull. of the Soviet Antarctic Expedition (JPRS-62019) 17 May 1974 p 18-25 refs Transl. into ENGLISH from Inform. Byul. Sov. Antarkt. Ekspeditsii (Leningrad), no. 87, 1973 p 29-34 (For availability see N74-25871 15-13)

The use of pilot balloons to study atmospheric circulation and dynamics in the Southern Hemisphere is revealed. Special balloons, the EOLE and the GHOST, and their observations are described. Author

N74-25875 Joint Publications Research Service, Arlington, Va.
TIE-IN OF GRAVIMETRIC POINTS MIRNYY-VOSTOK
M. M. Schneider *In its* Selected Transl. from Bull. of the Soviet Antarctic Expedition (JPRS-62019) 17 May 1974 p 26-28 refs Transl. into ENGLISH from Inform. Byul. Sov. Antarkt. Ekspeditsii (Leningrad), no. 87, 1973 p 55-56 (For availability see N74-25871 15-13)

A Gs-11 gravimeter no. 140 was used to measure earth tides and gravity differences between the Mirnyy and Vostok station during the Antarctic winter. Gravity differences were determined relative to the time interval observed at two control points designated as astropoints 1 and 2. Author

N74-25876*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
OPTICAL HOLOGRAPHY APPLICATIONS FOR THE ZERO-g ATMOSPHERIC CLOUD PHYSICS LABORATORY
Robert L. Kurtz Washington May 1974 79 p refs
(NASA-TR-R-424; M-463) Avail: NTIS HC $4.00 CSCL 04A

A complete description of holography is provided, both for the time-dependent case of moving scene holography and for the time-independent case of stationary holography. Further, a specific holographic arrangement for application to the detection of particle size distribution in an atmospheric simulation cloud chamber. In this chamber particle growth rate is investigated; therefore, the proposed holographic system must capture continuous particle motion in real time. Such a system is described. Author

N74-25877# National Environmental Satellite Service, Washington, D.C.
DETECTING MELTING SNOW AND ICE BY VISIBLE AND NEAR-INFRARED MEASUREMENTS FROM SATELLITES
David F. McGinnis [1974] 11 p refs
Avail: NTIS HC $4.00

Use of near-infrared data in conjunction with reflected visible radiation appears to allow detection of melting snow and ice. Comparison of simultaneous visible and near-infrared imagery from the Nimbus III satellite provides a method for monitoring the melting of snow and ice that may be applied to snowpack-runoff prediction, flood forecasting, and lake navigation. Several examples (Lake Winnipeg, the Alps, and northwest Canada) are provided to illustrate the use of this spectral difference. Author

N74-25878*# South Alabama Univ., Mobile. Dept. of Mechanical Engineering.
ATMOSPHERIC EFFECTS ON REMOTE SENSING OF NON-UNIFORM TEMPERATURE SOURCES Final Report, Mar. 1973 - Apr. 1974
William A. McNeill and Barry P. Dixon 1 May 1974 44 p refs
(Contract NAS8-28722)
(NASA-CR-129028) Avail: NTIS HC $5.25 CSCL 04A

The effects are considered of an absorbing, emitting, and scattering atmosphere upon the remote sensing of surface areas having non-uniform intensity. These atmospheric effects may be significant in determination, by remote sensing, of non-uniform surface temperature distributions, and the results of the investigation are applicable in such cases. Analytical methods and a digital computational program are presented, expressing the results in terms of contrast and contrast transmittance between two adjacent emitting areas having unequal intensities, in the presence of a additional disturbing emitters. In the computational procedure, emitting areas are replaced by point-source emitters, each assigned and effective intensity based upon the intensity of the area it replaces. Absorbing, emitting, and scattering behavior of the atmosphere may be specified in the computational procedure either by means of analytical atmospheric models or by means of calibrating ground level emitters. Author

N74-25879*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ON EVALUATING COMPLIANCE WITH AIR POLLUTION LEVELS NOT TO BE EXCEEDED MORE THAN ONCE PER YEAR
Harold E. Neustadter and Steven M. Sidik Washington Jun. 1974 19 p refs
(NASA-TN-D-7527; E-7762) Avail: NTIS HC $3.00 CSCL 04A

A major objective of air quality monitoring is often to determine compliance with air quality standards, which may in part consist of a 24-hour level not to be exceeded more than once a year. Calculational procedures are critiqued for estimating the corresponding ambient pollution level when a sampling program is operating in conformity with EPA guidelines, that is once every 3 to 6 days. Quantitative consideration is given to the questions of the statistical independence of the data, the commutativity of expectation and exponentiation operations, and the statistical variability of the calculated results. Monte-Carlo simulations indicate a 95-percent confidence interval of + or - 56 percent at 60 samples per year and + or - 40 percent at 120 samples per year. Based on these calculations, sampling frequencies of every third to every sixth day are inadequate for determining conformity with standards expressed as levels not to be exceeded more than once per year. Author

N74-25880# Geological Survey, Reston, Va.
EFFECTS OF THE 5-6 MAY 1973 STORM IN THE GREATER DENVER AREA, COLORADO
Wallace R. Hansen 1973 23 p refs
(USGS-Circ-689) Avail: NTIS HC $4.25; Free on application to the US Geological Survey, National Center, Reston, Va. 22092

Geologic and hydrologic processes activated by the May 5-6 storm caused extensive damage to lands and to manmade structures in the Greater Denver area. Damage was generally most intense in areas where man had modified the landscape-by channel constrictions, paving, stripping of vegetation and topsoil, and oversteepening of hillslopes. Roads, bridges, culverts, dams, canals, and the like were damaged or destroyed by erosion and sedimentation. Streambanks and structures along them were scoured. Thousands of acres of croplands, pasture, and developed urban lands were coated with mud and sand. Flooding was intensified by inadequate storm sewers, blocked drains, and obstructed drainage courses. Saturation of hillslopes along the Front Range caused rockfalls, landslides, and mudflows as far west as Berthoud Pass. Greater attention to geologic conditions in land use planning, design, and construction are suggested to minimize storm damage in the future. Author

N74-25881# National Ocean Survey, Rockville, Md.
TIDAL CURRENT TABLES 1974: PACIFIC COAST OF NORTH AMERICA AND ASIA
1973 256 p
Avail: NTIS MF $1.45; Natl. Ocean Survey, Rockville, Md.: HC $2.00

A compilation of tables on Pacific coast tidal currents is presented. Data cover daily predicted slack water times and predicted times and velocities of maximum current flood and ebb. E.H.W.

N74-25882*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN ATLAS OF VOLCANIC ASH
Grant Heiken Washington Smithsonian Inst. Press 1974 105 p refs
(NASA-TM-X-70087; Contrib-12) Avail: NTIS HC $8.25 CSCL 08M

Volcanic ash samples collected from a variety of recent eruptions were studied, using petrography, chemical analyses, and scanning electron microscopy to characterize each ash type and to relate ash morphology to magma composition and eruption type. The ashes are best placed into two broad genetic categories: magnetic and hydrovolcanic (phreatomagmatic). Ashes from magmatic eruptions are formed when expanding gases in the magma form a froth that loses its coherence as it approaches the ground surface. During hydrovolcanic eruptions, the magma is chilled on contact with ground or surface waters, resulting in violent steam eruptions. Within these two genetic categories, ashes from different magma types can be characterized. The pigeon hole classification used here is for convenience; there are eruptions which are driven by both phreatic and magmatic gases. Author

N74-25883# National Oceanic and Atmospheric Administration, Norman, Okla. National Severe Storms Lab.
MESOSCALE OBJECTIVE MAP ANALYSIS USING WEIGHTED TIME-SERIES OBSERVATIONS
Stanley L. Barnes Mar. 1973 66 p refs
(NOAA-TM-ERL-NSSL-62) Avail: NTIS HC $6.50

An objective map analysis technique, applicable to quasi-steady, translating atmospheric circulations, is developed from the mathematical premise that distributions of meteorological variables can be represented by an infinite sum of independent, harmonic waves. In addition to the usual space-weighting of simultaneous observations to obtain interpolated values at regularly arrayed grid points, the scheme uses asynoptic observations by positioning them relative to a moving disturbance and weighing them according to both space and time. Analysis response for several choices of the arbitrary parameters is tested on simple analytically determined distributions, and on selected meteorological observations during the passage of three thunderstorms over the National Severe Storms Laboratory mesonetwork of surface and upper air stations in central Oklahoma. Author

N74-25884*# Alaska Univ., Fairbanks. Geophysical Inst.
APPLICATIONS OF REMOTE SENSING DATA TO THE ALASKAN ENVIRONMENT Annual Report, 1 Jul. 1972 - 30 Jun. 1973
A. E. Belon and J. M. iller 30 Jun. 1973 68 p
(Grant NGL-02-001-092)
(NASA-CR-138512) Avail: NTIS HC $6.50 CSCL 08F

The ERTS program provides a means to overcome the formidable logistic and economic costs of preparing environmental surveys of the vast and relatively unexplored regions of Alaska. There is an excellent potential in satellite remote sensing to benefit Federal, state, local, and private agencies, by providing a new synoptic data base which is necessary for the preparation of the needed surveys and the search for solutions to environmental management problems. One approach in coupling satellite data to Alaskan problems is a major program initiated by the University of Alaska and funded by NASA's Goddard Space Flight Center. This included 12 projects whose aims were to study the feasibility of applying ERTS data to the disciplines of ecology, agriculture, hydrology, wildlife management, oceanography, geology, glaciology, volcanology, and archaeology. Author

N74-25885*# Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
THE APPLICATION OF SPACE TECHNOLOGY TO PRACTICAL PROBLEMS SUCH AS THOSE CURRENTLY FACING THE MOUNTAIN SECTIONS OF THE STATE OF COLORADO
Semiannual Report, 1 Jan. - 30 Jun. 1974
Jack D. Ives 4 Jun. 1974 7 p refs
(Grant NGL-06-003-200)
(NASA-CR-138500) Avail: NTIS HC $4.00 CSCL 08L

Rapid growth in small Colorado mountain communities and dangers posed by development in areas that are potentially dangerous to life and property due to natural processes are studied. Special attention was given to snow avalanche, mudflow, rockfall, landslide and flood, as well as the slow continuous and frequently imperceptible form of soil creep and associated mass movement. Data are also given on the relative reliability of ERTS and Skylab imagery and conventional photography in identifying avalanche paths and run out zones. E.H.W.

N74-25886*# Office of Telecommunications, Boulder, Colo.
MOLECULAR ATTENUATION AND PHASE DISPERSION BETWEEN 40 AND 140-GHz FOR PATH MODELS FROM DIFFERENT ALTITUDES
Hans J. Liebe and W. M. Welch May 1973 114 p refs
(NASA Order L-58506; Contract NOAA E-579-71)
(NASA-CR-138495; OTR-73-10) Avail: NTIS HC $18.75 CSCL 04A

Radio wave propagation in the 40 to 140 GHz band through the first hundred kilometers of the atmosphere is strongly influenced by the microwave spectrum of oxygen (O2-MS). A unified treatment of molecular attenuation and phase dispersion is formulated. Results of molecular physics are translated into frequency, temperature, pressure, and magnetic field dependencies of a complex refractive index. The intensity distribution of the O2-MS undergoes several changes with increasing altitude. The influence of water vapor is discussed. Examples of computer plots are given as a function of altitude for homogeneous, zenith, and tangential path geometries. Molecular resonances of minor atmospheric gases are discussed briefly. Author

N74-25887*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BEHAVIOR OF ATMOSPHERIC OZONE DETERMINED FROM NIMBUS SATELLITE BACKSCATTER ULTRAVIOLET DATA
Arlin J. Krueger May 1974 20 p refs Presented at the First IAMAP/IAPSO Spec. Assembly, Melbourne, 14-25 Jan. 1974
(NASA-TM-X-70652; X-910-74-101) Avail: NTIS HC $4.00 CSCL 04A

A substantial global data base on the spatial and temporal variations of high level atmospheric ozone distribution and total ozone amount for the time period 1970 through 1973 was obtained by the Backscatter Ultraviolet (BUV) instrument onboard the Nimbus 4 satellite. BUV total ozone data from all available orbits on each day of the period were processed to obtain zonal mean ozone amounts. Northern Hemisphere ozone and Southern Hemisphere ozone values are given, and the interhemispheric relationships identified. Vertical ozone profile information is interpreted to furnish data on seasonal total ozone changes. Selected ozone mixing ratio cross sections were analyzed, and the resulting zonally-symmetric patterns are presented. A.A.D.

N74-25888*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ESTIMATION OF SEA SURFACE TEMPERATURE FROM REMOTE SENSING IN THE 11-13 MICRON WINDOW REGION
C. Prabhakara, G. Dalu, and V. G. Kunde Feb. 1974 30 p refs Submitted for publication
(NASA-TM-X-70649; X-911-74-60) Avail: NTIS HC $4.50 CSCL 08J

The Nimbus 3 and 4 IRIS spectral data in the 11-13 micron water vapor window region are analyzed to determine the sea surface temperature (SST). The high spectral resolution data of IRIS are averaged over approximately 1 micron wide intervals to simulate channels of a radiometer to measure the SST. Three channels are utilized to measure SST over cloud-free oceans. However, two of these channels are sufficient in routine SST determination. The differential absorption properties of water vapor in the two channels enable one to determine the water vapor absorption correction without detailed knowledge of the vertical profiles of temperature and water vapor. The feasibility of determining the SST is demonstrated globally with Nimbus 3 data where cloud-free areas can be selected with the help of albedo data from the MRIR experiment on board the same satellite. Author

N74-25889*# Kanner (Leo) Associates, Redwood City, Calif.
HYDROLOGICAL BASIS FOR FORECASTING AND CALCULATING RUNOFF BY SPACE IMAGES OF THE EARTH'S SURFACE
G. P. Kalinin Washington NASA May 1974 43 p refs
Transl. into ENGLISH from the book "Gidrologicheskiye Osnovy Prognoza i Rascheta Stoka po Aerokosmicheskim Snimkam Zemnoy Poverkhnosti" Moscow, Akad. Nauk SSSR, 1974 53 p
(Contract NASw-2481)
(NASA-TT-F-15665) Avail: NTIS HC $5.25 CSCL 08H

The determination and prediction of surface runoff by remote methods are considered, using the following factors as a basis: (1) images of stream network and basin surface flooded areas, (2) area of coverage of the surface of a basin with water, (3) analysis of the dynamics of coverage of the basin with water and soil moisture content. D.L.G.

N74-25890*# Kanner (Leo) Associates, Redwood City, Calif.
THE CALCULATION OF CLOUD SHADOWS IN MODELING OF THE EARTH'S SURFACE FROM SPACE SURVEY
B. V. Vinogradov and A. B. Vinogradov Washington NASA Jun. 1974 10 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, Apr. 1974 p 37-42
(Contract NASw-2481)
(NASA-TT-F-15685) Avail: NTIS HC $4.00 CSCL 04A

An analytical formula is presented which describes the relations between sporadic cumulus cloud coverage of the earth's surface, sun height, and additional coverage by cloud shadows and area which can be inspected. It is found that a sun height of about 40-45 deg is the optimum for surveys of earth resources from a sun synchronous satellite. Author

N74-25891*# Kanner (Leo) Associates, Redwood City, Calif.
THE ACCURACY OF SATELLITE TEMPERATURE SOUNDING OF THE ATMOSPHERE
V. P. Tarakanova Washington NASA Jun. 1974 7 p refs
Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, Apr. 1974 p 76-78
(Contract NASw-2481)
(NASA-TT-F-15690) Avail: NTIS HC $4.00 CSCL 04A

Data are presented on the statistical structure of the errors of indirect satellite soundings at various levels in the atmosphere. Standard aerological sounding data are used. Comparison of the correlations at various levels demonstrates the lowest correlation at the 200 mb level. Data are presented on correlation of errors at various levels at the same point, in which case the correlations are below the significance level. This apparently is connected with the method of processing the indirect sounding data. Author

N74-25892*# Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION AND EVOLUTION OF A DUST-SAND STORM ABOVE NORTH AFRICA FROM METEOROLOGICAL SATELLITE PICTURES
V. B. Lipatov Washington NASA Jun. 1974 7 p refs
Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, Apr. 1974 p 78-80
(Contract NASw-2481)
(NASA-TT-F-15691) Avail: NTIS HC $4.00 CSCL 04A

From television images from the ITOS and ESSA meterological satellites, a dust-sand storm above North Africa was successfully recorded and its evolution was followed. The synoptic situation causing formation of the dust-sand storm and the dust flow at high altitudes over the Mediterranean Sea following the storm are discussed. Use of the images to estimate the transport rate of dust, size of the dust cloud and its lifetime, are mentioned. Author

N74-25893# Weapons Research Establishment, Salisbury (Australia).
RESULTS OF ROCKET SONDE MEASUREMENTS OF OZONE FROM WOOMERA (31 DEG S) AND THE ESTIMATION OF STRATOSPHERIC NITROGEN DIOXIDE CONCENTRATIONS
N. V. Sissons Jan. 1974 74 p refs
(WRE-TN-1089 (WR&D)) Avail: NTIS HC $6.75

Results from four rocket sonde measurements of the ozone distribution above Woomera, Australia are described, and comparison is made with ozone profiles from other locations. The effects of odd nitrogen upon the photochemical ozone distribution is studied using a simplified one-dimensional numerical model. Concentrations of nitrogen dioxide required to sustain the experimental ozone profiles were estimated and the results agree with recent experimental data for stratospheric nitrogen dioxide. Author

N74-25894# Aeronautical Research Labs., Melbourne (Australia).
THE EFFECT OF ATMOSPHERIC AEROSOLS ON THE APPARENT COLOURS OF SIGNAL LIGHTS: A LITERATURE SURVEY
B. A. J. Clark Oct. 1973 11 p refs
(ARL/Sys-37) Avail: NTIS HC $4.00

In fogs or dust storms, where the airborne particles responsible for light scattering are larger than about 2 micrometers, or where the particles are smaller than this but are varied in size, the scattering is practically independent of wavelength. If the particles are smaller and relatively uniform in size, wavelength-selective scattering of light can occur. This condition occurs with industrial haze, natural haze, smoke, and sometimes with fogs and as a consequence of dust storms. A literature survey indicated few attempts to assess the importance of selective scattering as an unwanted and possibly hazardous effect on the apparent colours of signal lights used in transport systems. A suggestion is made for data collection relevant to the possible hazard in aviation. Author

N74-25895*# Massachusetts Inst. of Tech., Cambridge.
RESEARCH IN VOLCANIC GEOLOGY, PETROLOGY AND PLANETARY SCIENCE AT MIT, 1969 TO 1974 Final Report
Thomas R. McGetchin May 1974 28 p refs
(Grants NGR-22-009-522; NGR-22-009-637; NSF GA-31728)
(NASA-CR-138508) Avail: NTIS HC $4.50 CSCL 08F

The behavior of volcanoes was studied by geologic mapping, petrologic investigations of lava and xenoliths, physical measurements, and theoretical modelling. Field observations were conducted in Alaska (Nunivak Island), Iceland, Hawaii (Mauna Kea), Italy (Etna, Stromboli), and Arizona. The results are discussed and compared with known data for lunar and planetary gelogy. Field methods used for the volcano research are cited and a list is given of all participating scientists and students. Publications and abstracts resulting from the research are also listed. A.A.D.

N74-25896*# Old Dominion Coll., Norfolk, Va.
CLEAN WATER: AFFLUENCE, INFLUENCE, EFFLUENTS. A DESIGN FOR WATER QUALITY MANAGEMENT
Albert E. Millar, Jr., ed., J. Darrell Gibson, ed., Richard D. Klafter, ed., Daniel L. Babcock, James E. Brandeberry, Victor V. Cavaroc, Harold N. Cones, Jr., Ralph G. Crum, J. C. Crumbley, III, Richard W. Faas et al 1971 241 p refs
(Contract NGT-47-003-028)
(NASA-CR-138498) Avail: NTIS HC $15.25 CSCL 08H

A systems design approach to the problem of water quality and pollution abatement is presented. The James River Basin in Virginia was used as a model to define the problem of declining water quality and to identify specific obstacles to effective water quality management. Data results from the case study are used to design a management system for water resources which can function in the context of community planning and legislation. Water treatment technologies are surveyed, and the underlying socio-political and economic impediments to clean water identified. Specific recommendations are made towards achieving public awareness and improved water quality. A.A.D.

N74-25897# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE MEASUREMENT OF SURFACE TEMPERATURES BY TELEVISION IN THE INFRARED
G. A. Boutry Apr. 1973 5 p refs Transl. into ENGLISH from Comptes Rendus (Paris), B. v., 266, 1968 p 214-217
(NTC-74-11889; Rept-73-121) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

It is shown that the use of television in the infrared furnishes a method of choice for the precise and very rapid study of the distribution of temperatures on a surface, without this distribution being perturbed by the measurement operation. Author

N74-25898# National Environmental Satellite Center, Washington, D.C.
CATALOG OF OPERATIONAL SATELLITE PRODUCTS
Eugene R. Hoppe and Abraham L. Ruiz Mar. 1974 100 p refs
(NOAA-TM-NESS-53) Avail: NTIS HC $8.00 CSCL 05B

The catalog is designed to acquaint the user community with the products generated from data acquired by sensors carried on environmental satellites controlled by the National Environmental Satellite Service. A brief description of the system is given; more detailed information can be found in the literature. The emphasis is on operations. A product is defined as any item routinely produced for applications within the environmental services. These range from the basic photographic image through a variety of manually produced and computer produced interpretative products. These products take the form of facsimile transmissions, photographic images, alphanumeric messages, and digital magnetic tapes. Author

N74-25899*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELS OF THE EARTH'S ELECTRIC FIELD
David Stern May 1974 20 p refs Submitted for publication
(NASA-TM-X-70666) Avail: NTIS HC $4.00 CSCL 08N

Detailed models of the electric field of the magnetosphere are derived in several stages. For all, the conductivity along field lines is assumed to be high enough to ensure the vanishing of E B everywhere except in the ionosphere. At first the rotation of the earth is ignored completely and a simple model is constructed which fits certain observed properties. Next, the rotation of the earth is taken into account, but the field is assumed to be that of a magnetic dipole rotating around its symmetry axis. This allows the concept of the electric potential to be retained, which permits the derivation of interesting properties including the use of a conjugate potential which paces the drift of charged particles in the field. Finally, the general case involving asymmetrical rotation is briefly discussed. Author

N74-25900*# Sandia Labs., Albuquerque, N.Mex. Applied Science Div.
EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL DIFFERENCES OF CAPE KENNEDY SOIL PARTICLES
D. M. Garst and W. J. Whitfield Jun. 1974 22 p refs
(NASA Order W-12853; Contract AT(29-1)-789)
(NASA-CR-138509; SLA-74-0234) Avail: NTIS HC $4.25 CSCL 08M

A preliminary study was conducted to investigate differences in the heat resistance of organisms associated with light and dark Cape Kennedy soil particles, as well as distinguishing characteristics of the particles. This study was requested by the NASA Planetary Quarantine Panel because of the relation between these organisms and the bioburden of outbound spacecraft. The light particles were solid, smooth surfaced, silica like in nature, while the dark particles appeared to be loosely bound agglomerates of organic material and silica. The dark particles contained about 30 times as many organisms as an equal weight of light particles. Several biological experiments revealed that organisms from both types of particles exhibited a nearly identical inactivation rate when they were subjected to a dry heat sterilizing environment. Author

N74-25901# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS Quarterly report, 1970 [OBSERVA-

TIONS D'OZONE]
1974 48 p ref In FRENCH and DUTCH
(QR-2) Avail: NTIS HC $5.50

Spectrophotometric ozone measurements are reported for the second quarter of 1970. The presented ozonograms contain designations for partial ozone pressure and atmospheric diffusion, air temperature, and used wavelengths. ESRO

N74-25902# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACE RESEARCH. INVESTIGATION OF THE GRAVITATIONAL FIELDS AND THE SHAPE OF THE EARTH, OTHER PLANETS AND THE MOON BY OBSERVATIONS FROM SPACE VEHICLES
L. P. Pellinen Jan. 1974 68 p refs Transl. into ENGLISH from Issled Kosmicheskogo Prostranstva (USSR), 1972, p 10-180
(AD-774398; FTD-MT-24-775-73) Avail: NTIS CSCL 08/5

Contents: Artificial satellites employed for determining the figure and the gravitational field of the earth; Methods of precise observations of artificial earth satellites; Geometric satellite plottings; The theory of artificial earth satellites motion in the gravitational field of the earth; Dynamic conclusions from artificial earth satellite; Fundamental geodetic constants; The orbit, gravitat field and figure on the moon; Determining the figures and the gravitational fields of the major planets. GRA

N74-25903# Lockheed Missiles and Space Co., Palo Alto, Calif.
IONOSPHERIC IRREGULARITIES: ALASKA PHOTOMETRIC MEASUREMENTS Final Report, 1 Dec. 1972 - 30 Nov. 1973
Robert D. Sears 4 Dec. 1973 79 p refs
(Contract DNA001-73-C-0110; DNA Proj. NWET-K43AAXH)
(AD-776241; LMSC-D354546; DNA-3235-F) Avail: NTIS CSCL 04/1

Photometric measurements of auroral intensities and structure were made in Alaska during 1972 and 1973. Photometric data supporting the ICE CAP 73A operations are presented in terms of definition of the energy input to the ionosphere in the spatial vicinity of the rocket borne in situ experiments. Coordinated analysis of spatial and temporal variations of auroral emission intensities and electron densities are outlined using both photometric intensity data and incoherent scatter radar data. Analysis of time variations of 4278A, 5875A, and 4861A emission intensities observed in 1972 indicates strong substorm time correlation with the intensity peaks, but no indication of He emission in the 5875A spectral region was found. An analytical method for converting F region 6300A, OI emission intensity structure maps into radar effects structure information was demonstrated for a low latitude region pertinent to radar scintillation effects measurements at Kwajalein Missile Range. Author (GRA)

N74-25904# Naval Research Lab., Washington, D.C.
SURFACE AND BOTTOM MAGNETIC SURVEY IN THE AREA OF THE BERMUDA RISE
P. B. Alers, J. M. Bergin, and D. Greenewalt 21 Dec. 1973 37 p refs
(AD-775900; NRL-7645) Avail: NTIS CSCL 08/14

A shipborne investigation of sea-floor magnetism was carried out in the three Marsden squares immediately west of Bermuda in November 1972. Both deep and surface magnetometers were used. The deep record was examined for the presence of short-wavelength (-5 km) geological anomalies; none were found. The bottom record was mathematically scaled to the surface and was found to be consistent with the surface record. The surface data were filtered to separate various noise components, and wave noise, geomagnetic noise, and geological noise sources were all identified. The upward continuation results, a magnetic chart of the area, and field data along representative tracks, together with spectra of peak height vs wavelength, were all derived. A detailed discussion of two different filter techniques is included as an appendix. Author (GRA)

N74-25905# Army Foreign Science and Technology Center, Charlottesville, Va.
COMPLEX OF PROGRAMS FOR COMPUTING COORDINATES OF PHOTOGRAPHIC POINTS ON ELECTRONIC COMPUTERS USING RESULTS OF RADIOGEODESIC MEASUREMENTS
V. N. Balandin 7 Nov. 1973 5 p Transl. into ENGLISH from Geodez. i Kartograf (Moscow), no. 9, 1971 p 47-48
(AD-776104; FSTC-HT-23-1266-72) Avail: NTIS CSCL 08/5

In 1970 the applied research laboratory of Soyuzmarkshtrest jointly with the aeromethod laboratory of the Oceanographic Institute developed a complex of computer programs for the computation of systematic co-ordinates of the photographing reference points from the results of measurement performed with the aid of radiogeodesic systems, acting on the principle of radio range, radio log, and phase probe. The programs are written in ALGOL-60 language and may be used for the electronic computers M-220, BESM-3, BESM-4, BESM-6. GRA

N74-25906# Utah State Univ., Logan. Center for Research in Aeronomy.
DEVELOPMENT STUDIES OF THE HYDROGEN-NITROGEN-OXYGEN SYSTEMS Final Report, 1 May 1970 - 30 Sep. 1973
William M. Moore and Thomas K. Eccles 31 Jan. 1974 136 p refs
(Contract F19628-70-C-0221; AF Proj. 8658)
(AD-775752; AFCRL-TR-73-0749) Avail: NTIS CSCL 04/1

A computer model has been developed which can predict the chemistry and photochemistry of the atmosphere in the regions of the upper stratosphere, mesophere, and lower thermosphere. The solar flux is calculated as a function of the sun's position with respect to any altitude above any coordinate point in the Northern Hemisphere. This means that the time dependent chemistry of the twilight periods can be treated in detail. The temperature altitude profiles are matched for seasonal and latitudinal changes. The chemical reaction set can be quickly changed, and laboratory problems can be treated by turning off the solar flux routines. The numerical integration method is new, rapid, and inherently conserves mass. A stiff equation technique is used to increase the time increment during steady-state conditions. The current model can be used to predict events that can be correlated with rocket observations, or other atmospheric measurements. (Modified author abstract) GRA

N74-25907# Arcon Corp., Wakefield, Mass.
MATHEMATICAL AND STATISTICAL ANALYSIS FOR THE REDUCTION OF IONOSPHERIC DATA AND OTHER PHYSICAL SYSTEMS Final Report, Sep. 1972 - Aug. 1973
Manfred Friedman, David C. Miller, Krishna-S. Vanguri, Joseph Gibbs, and Jean Hsu Hsiung Nov. 1973 209 p refs
(Contract F19628-71-C-0034; AF Proj. 5631; AF Proj. 8666)
(AD-776025; AFCRL-TR-73-0698) Avail: NTIS CSCL 04/1

The authors describe the techniques and computer programs developed to analyze various problems. Most of the work involved analysis and modeling ionospheric data collected at various places around the globe. This involved correlation studies, regression analysis, fitting non-linear time series and contour plotting. Computer programs for modeling the polar ionosphere and for updating models of ionospheric parameters with hourly measurements are developed. In addition, the authors prepared some efficient ray tracing programs using accurate electron density and magnetic field models, reduced and analyzed satellite measurements of electron densities in the ionosphere, and prepared theoretical and numerical solutions of electron transport characteristics in an irradiated solid. (Modified author abstract) GRA

N74-25908# Science Applications, Inc., La Jolla, Calif.
E AND F-REGION CHEMISTRY AND HIGH-LATITUDE IONOSPHERE Final Technical Report, 15 Jan. 1972 - 31 Dec. 1973
Daniel A. Hamlin, Benjamin F. Myers, Melvin R. Schoonover, and John I. Valerio 28 Feb. 1974 116 p refs
(Contract N00014-72-C-0292; ARPA Order 2020)
(AD-776238; SAI-74-537-LJ) Avail: NTIS CSCL 04/1

Contents: Calculated and observed photoelectron-flux spectra at dawn; the effect of uncertainties in rate coefficients on densities of E-region species; ionospheric-electron heating by dissociative recombination; temperature dependence for dissociative recombination of NO(+) in E- and F-region models. GRA

N74-25909# Lowell Technological Inst. Research Foundation, Mass.
COMPLEX AMPLITUDE MULTIFREQUENCY SCANNER, OPERATION AND CIRCUITRY Final Scientific Report, 1 Oct. 1969 - 31 Jan. 1973
Klaus Bibl, James E. Gorman, and Bodo W. Reinisch Jun. 1973 141 p refs
(Contract F19628-70-C-0032; AF Proj. 7663)
(AD-775751; LTIRF-358/IP; AFCRL-TR-73-0556) Avail: NTIS CSCL 04/1

An instrumental technique has been developed to measure complex amplitudes at six frequencies and three antennas for ionospheric drift studies. In cooperation with a Digisonde 128 or parts of it, the multifrequency complex amplitude scanner selects a set of two to six operating frequencies and changes receiver gain from pulse to pulse for each frequency, pulse width, height range and antenna. The digital data are interlaced with the preface which contains all the relevant operational information. Computer compatible recording formats prepare the magnetic tape recorded data for computer processing. Three identical systems are in operation at Eglin, Florida; Goose Bay, Labrador; and in a KC-135 aircraft of Air Force Cambridge Research Laboratories. Author (GRA)

N74-25910# Naval Research Lab., Washington, D.C.
PARALLEL PROPAGATION EFFECTS ON THE TYPE 1 ELECTROJET INSTABILITY
Sidney L. Ossakow, Konstantinos Papadopoulos, Joseph H. Orens, and Timothy P. Coffey Mar. 1974 29 p refs
(NRL Proj. A03-17)
(AD-775596; NRL-MR-2750) Avail: NTIS CSCL 04/1

The Farley-Buneman instability has been extended to consider higher frequency, shorter wavelength modes (thus including finite Debye length effects) while allowing these modes to propagate with a component parallel to the magnetic field (k parallel not = 0). By driving the current sufficiently hard (drift speeds in the range 2-3 times the ion thermal velocity, vi) the growth rates of these modes maximize slightly away from the perpendicular to the magnetic field showing the importance of k parallel not = 0. Although the wavelengths of these maximum growing modes are in the regime of several to tens of centimeters, the phase velocities are near the ion thermal velocity. This suggests that a nonlinear coupling of these off angle modes may be responsible for the observed radar spectrum with maximum intensity near vi and wavelengths in the 1-10 meter regime. Maximum growth rates of off angle propagation while varying the densities and collision frequencies are shown. Also, growth rates of unstable waves in the radar regime (1-10 meters) are shown for drift velocities 1.5 and 3 times vi. (Modified author abstract) GRA

N74-25911# Naval Research Lab., Washington, D.C.
COUPLED BARIUM CLOUD-IONOSPHERE SYSTEMS. 2: CONDUCTIVITY RATIO EFFECTS
A. J. Scannapieco, S. L. Ossakow, D. L. Book, and S. R. Goldman Mar. 1974 13 p refs
(DNA Proj. NWER-HC-040; NRL Proj. 77H02-27A)
(AD-775591; NRL-MR-2743) Avail: NTIS CSCL 04/1

The nonlinear motion of an F-region barium release electrostatically coupled to the E region is studied numerically. The effect of varying the conductivity ratio summation p to b/summation p to i and the formation of striations are discussed. Author (GRA)

N74-25912# Environmental Research Inst. of Michigan, Ann Arbor.
SEISMIC STUDIES. PART 1: SEISMIC AND ACOUSTIC DATA PROCESSING FOR DETERMINATION OF CPA (CLOSEST POINT OF APPROACH) AND MR (MULTI-RANGE) VEHICLE TRACKING PARAMETERS Final Report, 19 Mar. - 15 Jul. 1973
F. J. Tanis Mar. 1974 65 p
(Contract DAAK02-73-C-0230)
(AD-775940; ERIM-102500-6-F-1) Avail: NTIS CSCL 17/10

Existing seismic and acoustic vehicle signature data have been examined for characteristics which will yield two tracking parameters: closest point of approach (CPA) and multi-range (MR). MR refers to a pair of times which correspond to two vehicle/sensor ranges of known ratio. Several signal characteristics were investigated for their utility as predicters of CPA and MR. Signal processing characteristics of peak and time amplitude ratios were found to be useful for CPA and MR identification respectively. A processor was developed to smooth the signal to an integration rate. The time between fixed-size integration segments becomes proportional to an average signal level. While other characteristics were found to produce good CPA and MR times at short ranges, only the integration process was suitable at long ranges (200 m). However, to obtain CPA and MR times sufficiently accurate for an existing tracking algorithm will require more developmental testing and optimization than could be provided within the limits of this study. Preliminary work was also conducted on an acoustic bearing measurement device. Simulation results demonstrated that bearing could be accurately determined using a short-based microphone array. Author (GRA)

N74-25913# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFRARED RADIOMETER FOR GEOLOGICAL MAPPING
V. A. Verbitskii, A. G. Grammakov, B. M. Kolomytsev, and G. S. Smirnov 11 Mar. 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Priborostr. (Leningrad), v. 15, no. 3, 1972 p 110-111
(AD-776888; FTD-HT-23-912-74) Avail: NTIS CSCL 08/7

In the article the operating principle and operation of an infrared radiometer with a constant field of vision angle, which was designed for geological mapping from the natural infrared radiation of the earth, are described. A block-diagram is provided and the basic parameters of the instrument, obtained during laboratory and field tests of the radiometer, are presented. GRA

N74-25914# Illinois Univ., Urbana. Dept. of Civil Engineering.
SAPGOA - A COMPUTER PROGRAM FOR THE SIMULTANEOUS ADJUSTMENT OF PHOTOGRAMMETRIC AND GEODETIC OBSERVATIONS Civil Engineering Studies
K. W. Wong Jan. 1974 145 p refs
(Grant DA-ARO(D)-31-124-G1129)
(AD-776385; UILU-ENG-74-2003; Photogrammetry-Ser-38; AROD-8140-5-EN) Avail: NTIS CSCL 08/5

The primary function of the program SAPGOA is to perform analytical aerotriangulation by the method of simultaneous weighted least-squares adjustment. It has the unique capability of using geodetic measurements as controls in the aerotriangulation solution. The program can accept as input the following types of observations: (1) photogrammetric observations: rectangular photo coordinates corrected for lens and film distortions, exterior orientation parameters of each photo, aircraft altitude above ground at each exposure, and ground controls in a rectangular ground coordinate system; and (2) geodetic observations: straight-line distances, geodetic azimuths, Laplace azimuths, horizontal angles, elevation differences, latitudes, longitudes and elevations. The geodetic measurements do not have to form an integrated geodetic network. Author (GRA)

N74-25915# Naval Research Lab., Washington, D.C.
PRELIMINARY REPORT IN NUMERICAL SIMULATION OF TYPE 2 IRREGULARITIES IN THE EQUATORIAL ELECTROJET
B. E. McDonald, T. P. Coffey, S. L. Ossakow, and R. N. Sudan Mar. 1974 18 p refs
(RR0330242)
(AD-776545; NRL-MR-2747) Avail: NTIS CSCL 04/1

A computer simulation accounts for some of the observed features of short wavelength irregularities in the equatorial electrojet. Two dimensional fluid equations for ion number density, velocity, and electrostatic potential are solved in the rest frame of the neutral atmosphere. The initial configuration is gradient-drift unstable. Growth of small amplitude fluctuations agrees with linear theory. When the density fluctuation reaches about 5%, nonlinear effects become noticeable. As the instability grows, the flow becomes similar to 2D turbulence. The late time spectral power decreases as K to the minus 3.5 power in agreement with theory and observations. Author (GRA)

N74-25916# Naval Postgraduate School, Monterey, Calif.
INITIALIZATION OF A 5-LEVEL GLOBAL ATMOSPHERIC GENERAL CIRCULATION MODEL USING A STAGGERED, SPHERICAL, SIGMA COORDINATE SYSTEM M.S. Thesis
James Michael McCollough Mar. 1974 98 p refs
(AD-776321) Avail: NTIS CSCL 04/1

Initialization of a five-level global baroclinic primitive equation model was examined using real data. Experiments were conducted using a Robert (1965) time frequency filter, Euler backward time integration, and an iterative initialization scheme to determine the effect of each on the generation of inertial-gravity waves resulting from an improper balance between initial mass and wind fields. In addition, a global sigma-surface linear balance equation solution was examined for the purpose of determining initial winds. Although all forecast fields were meteorological, certain undesirable features were generated in the polar and equatorial regions. Author (GRA)

N74-25917# Texas Univ., El Paso. Dept. of Electrical Engineering.
ATMOSPHERIC MODELING FOR MOLECULAR ABSORPTION RESEARCH PROJECT Final Report
Joseph H. Pierluissi 31 Jan. 1974 66 p refs
(Contract DAAD07-73-C-0127)
(AD-776971; PR2-74-AM-5) Avail: NTIS CSCL 04/1

The project developed a number of phenomenological and physical variations of the five-parameter band model for molecular transmittance in the infrared using data from line-by-line calculations in the 15 micron - CO2 band. Conversion from a standard inhomogeneous atmosphere to a homogeneous medium is obtained with the use of modified Curtis-Godson relations and calculated line intensities averaged over 5/cm. Comparisons are made between the calculated and original data indicating that band modeling yields accuracies comparable to the degree of validity of the original transmittance provided that the number and nature of the band parameters are allowed spectral dependence. (Modified author abstract) GRA

N74-25918# Lowell Technological Inst. Research Foundation, Mass.
ROUTINE OPERATION OF DIGISONDE AT MAYNARD, MASSACHUSETTS Final Report, 1 Sep. 1971 - 31 Aug. 1972
Klaus Bibl, Bodo W. Reinisch, Sheryl Smith, and Robert K. Temple Jun. 1973 63 p refs
(Contract F19628-72-C-0061; AF Proj. 5631)
(AD-776969; LTIRF-356/IP; AFCRL-TR-73-0348) Avail: NTIS CSCL 04/1

Digital Ionosonde DGS 128-3 was operated and maintained at Maynard, Massachusetts, during the period from 31 August 1971 to 31 August 1972. Continuous monitoring of the ionosphere by vertical pulse sounding produced twelve months of ionospheric data for E- and F-region studies. Digital data, obtained for more than 98 per cent of the entire period, was recorded continuously on magnetic tape. Hourly ionograms were produced on-line by a printer using a special number font. Magnetic tape and hourly ionograms, collected daily, were reduced and scaled for seventeen URSI parameters and presented for publication in the AFCRL Geophysics and Space Data Bulletin. A unique calibration scheme was implemented which automatically recorded the system amplitude versus frequency response and system linearity. Author (GRA)

N74-25919# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SURVEY OF TWO-BODY AND THREE-BODY REACTION-RATE COEFFICIENTS FOR THE IONIZED STRATOSPHERE AND MESOSPHERE
Franklin E. Niles Mar. 1974 106 p refs
(DA Proj. 1T1-61102-B-53)
(AD-776950; BRL-1702) Avail: NTIS CSCL 04/1

Rate coefficients for two-body and three-body reactions applicable to the ionized stratosphere and mesosphere have been surveyed. The reactions are divided into five classes, viz., (1) positive-ion reactions, (2) electron reactions, (3) negative-ion reactions, (4) ion-ion reactions, and (5) neutral reactions. Reactions and their measured rate coefficients are given in tables and the values selected for inclusion in the AIRCHEM atmospheric deionization computer code are identified. The current status of knowledge regarding these reactions is summarized. Author (GRA)

N74-25920# Glenn (A.H.) and Associates, New Orleans, La.
WIND, WAVE, WATER LEVEL, AND ICE CONDITIONS AFFECTING DESIGN AND CONSTRUCTION OF THE PROPOSED LAKE ERIE INTERNATIONAL JETPORT, CLEVELAND, OHIO Final Report
Mar. 1974 64 p refs
(Contract DACW39-73-C-0063)
(AD-776975; AEWES-CR-H-74-1) Avail: NTIS CSCL 04/2

A wave handcast for Lake Erie at Cleveland, Ohio has been prepared using 10 years of recorded wind data from Lakefront Airport supplemented by wind data from Cleveland Hopkins Airport. Average monthly and annual significant wave height, significant period, directional distribution, and percentage of occurrence are tabulated for stations located in Lake Erie. The storm wave characteristics are summarized to show storm wave height and period analysis for the 30 most severe storms occurring during the hindcast period and for the severe storms of November 1913 and November 1950. Author

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-25921 Missouri Univ., Columbia.
AN EVALUATION OF A SPECTRORADIOMETER FOR THE VISIBLE AND NEAR UV Ph.D. Thesis
Aswini Kumar Mahapatra 1973 132 p
Avail: Univ. Microfilms Order No. 74-9964

A spectroradiometer based on a system employing narrow band pass interference filters and photomultiplier tube is used in the measurement of solar irradiance at normal incidence at the surface of the earth. The method of calibration consists of comparing the spectral irradiance of the sun with that of an NBS standard. From a logarithmic plot of observed surface values of solar irradiance against optical air mass the spectral irradiance at normal incidence outside the atmosphere and the total optical depth of the atmosphere have been estimated. An attempt has been made to adopt an atmospheric attenuation model after moon (1940) and make necessary adjustment in the value of dust concentration and the exponent of lambda to have better agreement with observed data. In the absence of actual measurement with observed data. In the absence of actual measurement of dust parameters the attenuation model has been found inadequate to predict the surface values of solar irradiance from a knowledge of solar irradiance outside the atmosphere and vice versa. Dissert. Abstr.

N74-25922 Illinois Univ., Urbana.
ULTRA HIGH-SPEED PHOTOGRAPHY USING A PULSED RUBY LASER AND AN ACOUSTO-OPTIC BEAM DEFLECTOR Ph.D. Thesis
Donald Richard Henley 1973 60 p
Avail: Univ. Microfilms Order No. 74-12040

An ultra high-speed framing camera has been designed primarily for use in the area of photomechanics. Photoelastic fringes traveling at 78,000 inches per second have been filmed at framing rates of 100,000 frames per second. The field of view is 10 inches in diameter. An acousto-optic deflector diffracts each successive burst of light from a Q-switched ruby laser to a different lens in a large array. This array of lenses then acts as a light source for a camera of the familiar Cranz-Schardin configuration. All of the components of this system are capable of operating up to a million cycles per second. The electronics of the system have been designed so that the time of each exposure can be independently varied. This camera has a great deal of potential in studying problems that are destructive in nature such as crack propagation problems. It has also been pointed out that with minor modifications the system can be used to obtain ultra high-speed holograms. Dissert. Abstr.

N74-25923 Montana State Univ., Missoula.
THE APPLICATION OF FURNACE ATOMIC ABSORPTION TO THE SOLUTION OF PROBLEMS IN ENVIRONMENTAL ANALYSIS Ph.D. Thesis
Jerome Francis Lech 1973 113 p
Avail: Univ. Microfilms Order No. 74-10305

A method is developed for the determination of lead in air particulates using furnace atomic absorption. By using porous graphite as a filter medium the atomic absorption determinations can be carried out with no intermediate treatment. Using particles generated by the condensation of lead chloride vapors and which ranged from 0.1 to 1.5 u m in diameter a statistical comparison was made between porous graphite filters and membrane filters and the values obtained were found to be statistically similar at 95% confidence. Both the porous graphite filters, and the membrane filters failed to retain any traces of organic lead from even large excesses. Porous graphite filters, however, were much more convenient to use and they were found to be more precise. The application of the method of cadmium and manganeese in air particulates is briefly demonstrated. Dissert. Abstr.

N74-25924*# Bendix Corp., Teterboro, N.J. Navigation and Control Div.
MULTIFUNCTION DISPLAY SYSTEM Final Report
Kenneth Kendall Sep. 1973 61 p
(Contract NAS8-27564)
(NASA-CR-120223; DCN-2-1-15-11267) Avail: NTIS HC $6.25 CSCL 14B

The design and characteristics of a multifunction display system are discussed. The system is a general purpose, time-shared, electro-optical display driven by onboard data management systems. It is capable of presenting information in forms such as alphanumerics, symbolics, and graphics, separately or in combination. The components of the system are: (1) data terminal simulator/input loader, (2) keyboard controller, (3) CRT display indicator, and (4) programmable symbol generator. Author

N74-25925*# Texas Instruments, Inc., Dallas. Equipment Group.
MARINER JUPITER/SATURN 1977 INFRARED INTERFEROMETER SPECTROMETER (MJS' 77) DESIGN STUDY Final Technical Letter Report
Apr. 1974 131 p refs
(Contract NAS5-23270)
(NASA-CR-139006; Doc-859505) Avail: NTIS HC $9.75 CSCL 14B

A design study of the Infrared Interferometer Spectrometer and Radiometer (IRIS) instrument for the Mariner Jupiter/Saturn 1977 mission was conducted. The objective of the study was to investigate a number a potential problem areas identified in previous studies and to develop the instrument system designs along the lines providing for the optimum performance obtainable with the allowable budgets. The considerations for the optical design, mechanical design, and electronic design are examined. Author

N74-25926*# Rensselaer Polytechnic Inst., Troy, N.Y.
ANALYSIS OF CHROMATOGRAPH SYSTEMS USING ORTHOGONAL COLLOCATION
Philip T. Woodrow May 1974 137 p refs Sponsored in part by HEW
(Grant NGL-33-018-091)
(NASA-CR-138461; RPI-TR-MP-40) Avail: NTIS HC $10.00 CSCL 14B

Research is generating fundamental engineering design techniques and concepts for the chromatographic separator of a chemical analysis system for an unmanned, Martian roving vehicle. A chromatograph model is developed which incorporates previously neglected transport mechanisms. The numerical technique of orthogonal collocation is studied. To establish the utility of the method, three models of increasing complexity are considered, the latter two being limiting cases of the derived model: (1) a simple, diffusion-convection model; (2) a rate of adsorption limited, inter-intraparticle model; and (3) an inter-intraparticle model with negligible mass transfer resistance. Author

N74-25927*# Geoscience, Ltd., Solana Beach, Calif.
DEVELOPMENT OF A PROTOTYPE FLUID VOLUME MEASUREMENT SYSTEM
H. F. Poppendiek, C. M. Sabin, and P. T. Meckel Apr. 1974 38 p ref
(Contract NAS9-13461)
(NASA-CR-134274; GLR-124) Avail: NTIS HC $5.00 CSCL 14B

The research is reported in applying the axial fluid temperature differential flowmeter to a urine volume measurement system for space missions. The fluid volume measurement system is described along with the prototype equipment package. Flowmeter calibration, electronic signal processing, and typical void volume measurements are also described. F.O.S.

N74-25928# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
NOISE DOSIMETER PERFORMANCE
Kenneth C. Stewart and Timothy Y. Yen 1974 45 p
(BM-RI-7876) Avail: NTIS HC $5.25

Eight brands (three samples of each kind) of commercially available audio dosimeters were performance tested. Each unit was placed in an anechoic chamber and subjected to various acoustic signals to measure its A-weighting response and overall integration accuracy. All units met the A-weighting tolerance for type 2 sound level meters, and six brands were within overall accuracy requirements of plus or minus 2 dbA referred to input. Author

N74-25929*# Lockheed Electronics Co., Houston, Tex.
DIGITAL TEMPERATURE SENSOR PERFORMANCE ASSESSMENT REPORT
J. H. Canniff Apr. 1974 46 p
(Contract NAS9-12200)
(NASA-CR-134273; LEC-3318; JSC-09002) Avail: NTIS HC $5.50 CSCL 14B

Performance assessment data accumulated during exposure of the digital temperature sensor to simulated shuttle flight type environments are presented. The test parameters were specifically designed to check the sensor for its: (1) ability to resolve temperature relative to the design specifications; (2) ability to maintain accuracy after interchanging the temperature probes with each electronics interface assembly; (3) stability (i.e., satisfactory operation and accuracy during and after exposure to flight environments); and (4) repeatability, or its ability to produce the same output on subsequent exposures to the identical stimulus. Equipment list, test descriptions, data summary, and conclusions are included. Author

N74-25930# National Bureau of Standards, Washington, D.C. Inst. for Basic Standards.
THERMOCOUPLE REFERENCE TABLES BASED ON THE IPTS-68 Final Report
Robert L. Powell, William J. Hall, Clyde H. Hyink, Jr., Larry L. Sparks, George W. Burns, Margaret G. Scroger, and Harmon H. Plumb Mar. 1974 412 p refs Supercedes NBS-Circ-561
(NBS Proj. 2750101)
(NBS-Monograph-125; NBS-Circ-561) Avail: SOD HC $4.55 as C13.44:125

Reference data for thermocouples are contained in tables, analytic expressions, various approximations, along with an explanatory text. Only the standard letter-designated thermocouples are described: noble metal Tyes S, R, and B and base metal Types E, J, K, and T. Their appropriate 'single-leg' or thermoelement versus Pt-67 values are also included. The new reference data reflect not only revisions in the temperature scale, but also slight changes in the materials themselves and improvements in data fitting methods. The temperature ranges vary for different types, from a low of -270 C for Type E to a high of 1820 C for Type B. The main functions and tables are given in terms of Celsius degrees and microvolts. Tables in the appendices represent the data with less precision, in millivolts, and in degrees Fahrenheit as well as Celsius. Approximate quadratic, cubic, and quartic analytic expressions are also given for each thermocouple type in various temperature ranges. Author

N74-25931*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SELF-SUPPORTING STRAIN TRANSDUCER Patent Application
Ira S. Hoffman, inventor (to NASA) Issued 23 May 1974 11 p
(NASA-Case-LAR-11263-1; US-Patent-Appl-SN-472775) Avail: NTIS HC $4.00 CSCL 14B

A strain transducer for use in the measurement of static or quasi-static high strain levels at stress concentration points in holes in flat plates is described. Cantilever springs constructed by machining the material to appropriate flexibility, permit self-alignment, and constant contact with the test specimen. Used in conjunction with a strain gage or other transducer, it enables testing far beyond the strain gage's normal limits for high strains and number of load cycles. NASA

N74-25932*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUORESCENCE DETECTOR FOR MONITORING ATMOSPHERIC POLLUTANTS Patent Application
Robert T. Menzies, Inventor (to NASA) (JPL) Issued 27 Dec. 1973 12 p
(Contract NAS7-100)
(NASA-Case-NPO-13231-1; US-Patent-Appl-SN-428993) Avail: NTIS HC $4.00 CSCL 14B

A gas molecule detector was used to discover the presence of pollutants in the atmosphere. A laser source excites the pollutants to fluorscence and emit a return signal to the detector. The pollutants are captured in a gas cell containing two compartments. The first absorbs the fluorescence from the signal and the second contains the absorbed emission. A difference measuring circuit detects the difference in output signals from the two compartments in order to obtain a signal indicative of the magnitude of the pollutant being analyzed. NASA

N74-25933# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD FLIGHT TEST INSTRUMENTATION SERVICES. VOLUME 1: BASIC PRINCIPLES OF FLIGHT TEST INSTRUMENTATION ENGINEERING
A. Pool, ed. and D. Bosman, ed. Apr. 1974 168 p refs
(AGARDograph-160-Vol-1; AGARD-AG-160-Vol-1) Avail: NTIS HC $11.50

Monographs on the more important aspects of flight test instrumentation are presented. The subjects discussed include: (1) in-flight temperature measurements, (2) fuel flow and engine rotation speed measurements, (3) open and closed-loop accelerometers, and (4) magnetic tape recording. The main emphasis is on large automated instrumentation systems for the initial flight testing of modern military and civil aircraft. The overall areas of consideration are the design of the instrumentation system, the characteristics of the individual measuring channel, and the integration of the individual data channels into one data collection system. For individual titles, see N74-25934 through N74-25945.

N74-25934 British Aircraft Corp., Preston (England).
THE USERS' REQUIREMENTS
M. L. Henney *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 9 p refs (For availability see N74-25933 15-14)

The process for determining the general requirements for a flight test instrumentation system is discussed. The manner in which the requirements are derived is indicated by considering the test planning process and data analysis. Specific requirements arising in various categories of tests are detailed. Explanation of the data analysis requirements is given. The application of the selection process to flight tests of uncertificated and certificated aircraft is compared. Author

N74-25935* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INDUCTION INTO THE DESIGN OF FLIGHT TEST INSTRUMENTATION SYSTEMS
B. L. Dove *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 9 p refs (For availability see N74-25933 15-14)

The development of flight test instrumentation systems based on specific requirements for the flight tests is discussed. The factors which influence the instrumentation system design are described. The use of a measurements list as a device for determining flight test requirements is explained. A block diagram of a typical flight test instrumentation system is provided. The effects of factors such as cost, schedule, personnel, accuracy, environmental qualifications, and reliability are analyzed. Author

N74-25936 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
METEOROLOGICAL CHARACTERISTICS OF A MEASURING CHANNEL
J. Idrac *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 11 p refs (For availability see N74-25933 15-14)

An analysis of the fundamental characteristics of a measuring process is provided. The technical aspects of designing a measuring channel are discussed. The phases in a measuring operation are explained. The errors in measurement are analyzed to show the type of errors, the shape of the distribution curve, and the effects of various degrees of error. Curves are developed to show the amplitude and response characteristics of flight instrumentation systems. Author

N74-25937* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
TRANSDUCERS
L. H. Weirather *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 14 p refs (For availability see N74-25933 15-14)

The use of transducers in the measuring channels of flight test instrumentation systems is discussed. Emphasis is placed on transducers with an electrical output. The physical effects used for producing the electrical outputs are defined. Diagrams of the various types of transducers are included to show the operating principles. Author

N74-25938 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
SIGNAL CONDITIONING
W. G. James *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 15 p refs (For availability see N74-25933 15-14)

The signal conditioning of transducer signals obtained during flight test data recording is discussed. The linear operations performed on the signal are defined. Signal conversion techniques based on amplitude modulation, frequency modulation, pulse duration modulation, and pulse code modulation are analyzed. Circuit diagrams of signal conditioning systems are provided. Author

N74-25939 Radiation, Inc., Melbourne, Fla.
SAMPLING AND FILTERING
L. W. Gardenhire *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 13 p refs (For availability see N74-25933 15-14)

The characteristics of data sampling and filtering systems used in flight test instrument systems are described. The different approaches of data compression, redundancy reduction, and asynchronous sampling are analyzed. The errors of commission and aliasing are analyzed to show the effects on system accuracy. Curves are developed to compare frequency against attenuation for various data recording systems. Author

N74-25940 Boeing Co., Seattle, Wash.
CALIBRATION
D. A. Tougas *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 9 p refs (For availability see N74-25933 15-14)

The various types of calibration which are used with flight test instrumentation systems are described. The conditions under which limited calibration procedures may be applied are defined. The choice of the calibration standard and the points used in system calibration are analyzed. The calibration of a test instrument or measurement system for environmental parameters is emphasized. Author

N74-25941 Boeing Co., Seattle, Wash.
TECHNICAL ASPECTS IN THE DESIGN OF MULTI-CHANNEL DATA COLLECTION SYSTEMS
H. L. Tollisen and R. L. VanDerVelde (Natl. Aerospace Lab., Amsterdam) *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 18 p refs (For availability see N74-25933 15-14)

The technical requirements to be met in the design of multichannel flight test instrument systems are defined. It is stated that reliability and accuracy are the leading considerations in the choice of the components and the design of the system and the wiring. The selection of on board recording and telemetry equipment is analyzed. The design and development of data processing equipment are explained. A block diagram of a data collection system with common signal conditioners is provided. The procedure for integrating the main components into a complete system is discussed. Author

N74-25942 Societe de Fabrication d' Instruments de Mesure SFIM, Massy (France).
ON-BOARD RECORDING
C. Roquefeuill *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 12 p refs (For availability see N74-25933 15-14)

The recording methods used in flight test evaluations are discussed. The systems in general use are identified as: (1) photo panel recorders, (2) continuous trace recorders, (3) analog magnetic tape recorders, and (4) digital magnetic tape recorders. Advantages and disadvantages of the systems are analyzed. Block diagrams of a typical airborne analog magnetic recording system and an airborne digital magnetic recording system are provided. Author

N74-25943 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TELEMETRY c07
A. Becker *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 13 p refs (For availability see N74-25933 15-14)

The telemetry component of a flight test instrument system is described. A block diagram of a typical telemetry system is provided. Curves are developed to show the modulation methods used with telemetry systems. Examples of supercommutation and subcommutation are illustrated. Systems of on-line data processing using analog computing methods, digital computing methods, and hybrid computing methods are discussed. Author

N74-25944 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
GROUND-BASED EQUIPMENT c11
O. Weber *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 11 p refs (For availability see N74-25933 15-14)

The ground based equipment, often in combination with airborne telemetry equipment, is discussed from the standpoint of trajectory measurement. An important aspect of ground based equipment is time synchronization with recordings made on board the aircraft. The capabilities of a trajectory measuring system are explained. The selection of a site and the procedure for setting up the equipment are analyzed. The methods used to obtain synchronization of the recording devices are reported. Author

N74-25945 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
DATA PROCESSING c08
J. Perrochon and J. T. M. VanDoorn *In* AGARD AGARD Flight Test Instrumentation Ser., Vol. 1 Apr. 1974 14 p refs (For availability see N74-25933 15-14)

A functional analysis of the data processing systems used for flight test instruments is presented. The types of data input are identified. Preprocessing of data is discussed and the main functions of the procedure are reported. Medium sized and large stations with a relatively large amount of automation, are emphasized. Author

N74-25946*# Kollsman Instrument Corp., Syosset, N.Y.
TARGET ACQUISITION AND POSITIONING STUDY (TAPS) Final Project Report
Mar. 1974 66 p refs
(Contract NAS5-23251)
(NASA-CR-139016) Avail: NTIS HC $6.50 CSCL 20F

The Scientific Instruments for the Large Space Telescope (LST) require a high degree of accuracy for positioning targets within their respective entrance apertures. The acquisition, verification of position, and guidance during an experiment must be accomplished with a minimum loss of observing time for the maximum effectiveness of the total mission. This study evaluates several viable concepts and modes of operation that are applicable for a Target Acquisition and Positioning System (TAPS) that is responsive to the LST instrument requirements. Author

N74-25947# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICAL QUENCHING OF THE GUDDEN-POHL EFFECT IN ZINC-SULPHIDE LUMINOPHORS AND IR-PHOTOGRAPHY
A. G. Goldman and A. I. Proskura Apr. 1973 15 p refs Transl. into ENGLISH from Uhr. Fiz. Zh. (Kiev), v. 17, no. 5, 1972 p 783-788
(NTC-74-11860; Rept-73-109) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The optical quenching of the Gudden-pohl effect (GPE) in zinc sulphide luminophors was studied experimentally. GPE was quenched with longwave radiation within a range of 0.5 - 0.8 and 1.32 microns. The degree of quenching as a function of the radiation dose was investigated. The interchangeability rule in the quenching of GPE with IR-radiation was verified. Quenching of the GPE scintillation is applied to a negative photographic process. Author

N74-25948*# National Aeronautics and Space Administration, Washington, D.C.
ANALYTICAL TECHNIQUES AND INSTRUMENTATION, A COMPILATION
[1974] 25 p refs
(NASA-SP-5957(01)) Avail: NTIS HC $1.00 CSCL 14B

Procedures for conducting materials tests and structural analyses of aerospace components are presented as a part of the NASA technology utilization program. Some of the subjects discussed are as follows: (1) failures in cryogenic tank insulation, (2) friction characteristics of graphite and graphite-metal combinations, (3) evaluation of polymeric products in thermal-vacuum environment, (4) erosion of metals by multiple impacts with water, (5) mass loading effects on vibrated ring and shell structures, (6) nonlinear damping in structures, and (7) method for estimating reliability of randomly excited structures. Author

N74-25949*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THREE STAGE GAS DILUTION SYSTEM FOR CALIBRATION OF AIR QUALITY INSTRUMENTATION
Gerald L. Gregory, Burt R. Emerson, and Charles H. Hudgins Apr. 1974 16 p ref
(NASA-TM-X-71946) Avail: NTIS HC $3.00 CSCL 14B

Tests were conducted on a three stage gas dilution system to evaluate the performance of the system for preparation of gas mixtures in the range of concentrations from 1 to 200 ppm. The test gas used in the evaluation was carbon monoxide. Mixtures of carbon monoxide and air were prepared in the gas dilution system and analyzed on stream with a commercially available infrared CO detector. Results showed the gas dilution system to be accurate to within 5, 3, and 2 percent in the respective ranges of 1-20 ppm, 20-50 ppm, and 50-200 ppm. Author

N74-25950*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW MEASUREMENT IN BASE COOLING AIR PASSAGES OF A ROTATING TURBINE BLADE
Curt H. Liebert and Frank G. Pollack Washington Jun. 1974 29 p refs
(NASA-TN-D-7697; E-7886) Avail: NTIS HC $3.25 CSCL 20D

The operational performance is decribed of a shaft-mounted system for measuring the air mass flow rate in the base cooling passages of a rotating turbine blade. Shaft speeds of 0 to 9000 rpm, air mass flow rates of 0.0035 to 0.039 kg/sec (0.0077 to 0.085 lbm/sec), and blade air temperatures of 300 to 385 K

(80 to 233 F) were measured. Comparisons of individual rotating blade flows and corresponding stationary supply orifice flows agreed to within 10 percent. Author

N74-25951*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USE OF FLUIDIC OSCILLATOR TO MEASURE FUEL-AIR RATIOS OF COMBUSTION GASES
Stephen M. Riddlebaugh Washington Jun. 1974 24 p
(NASA-TM-X-3068; E-7872) Avail: NTIS HC $3.00 CSCL 14B

A fluidic oscillator was investigated for use in measuring fuel-air ratios in hydrocarbon combustion processes. The oscillator was operated with dry exhaust gas from an experimental combustor burning ASTM A-1 fuel. Tests were conducted with fuel-air ratios between 0.015 and 0.031. Fuel-air ratios determined by oscillator frequency were within 0.001 of the values computed from separate flow measurements of the air and fuel. Author

N74-25952*# Scientific Translation Service, Santa Barbara, Calif.
A FILM THERMOCOUPLE WITH A PLATINUM ELECTRODE FOR THERMOMETRY OF GAS TURBINE ENGINE BLADES
A. Ya. Anikin, L. S. Grigoryev, and D. F. Simbirskiy Washington NASA Jun. 1974 11 p refs Transl. into ENGLISH from Samoletostroyeniye i Tekhn. Vozdushnogo Flota, no. 32, 1973 p 31-36
(Contract NASw-2483)
(NASA-TT-F-15625) Avail: NTIS HC $4.00 CSCL 14B

An investigation is made of platinum used for film thermoelectrodes. A description is given of the tests, and it is concluded that a platinum film thermoelectrode has adequate stability for technical applications. Author

N74-25953*# Kanner (Leo) Associates, Redwood City, Calif.
THE EFFECT OF CLOUDS ON THE IDENTIFICATION OF THE EARTH'S SURFACE IN VISUAL OBSERVATIONS AND PHOTOGRAPHY FROM SPACE
B. V. Vinogradov, V. B. Lipatov, and V. I. Sevastyanov Washington NASA Jun. 1974 24 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, Apr. 1974 p 43-50
(Contract NASw-2481)
(NASA-TT-F-15686) Avail: NTIS HC $4.25 CSCL 14E

The results of visual observations of the earth's surface by an astronaut, with sporadic cloudiness and shadowing of the surface, are presented. Using photos of the Sal'sk steppes, a considerable reduction on interpretation possibilities in the presence of clouds and their shadows is demonstrated. The effect of coverage by sporadic and solid cloud models on the capability of reconstruction of images of two types of targets in sections masked by clouds and shadows is analyzed. With 44% coverage, at least 4 photos must be made of a key section to obtain an image of the entire territory with 0.95 probability. There is a limited capability of interpolation of data onto areas masked by clouds and shadows. Author

N74-25954# Electrotechnical Lab., Tokyo (Japan).
THERMAL DETECTORS OF OPTICAL RADIATION
Kazuki Ito Dec. 1973 100 p refs In JAPANESE; ENGLISH summary
(Circ-177) Avail: NTIS HC $8.00

Thermal radiation detectors are reviewed to establish and improve the methods of measurement required in the applications of optical radiation. Radiometry in the limited wavelengths, from ultraviolet in air, to infrared in tens of micrometers, is considered. Thermopiles and bolometers are considered, and a brief survey given of pyroelectric detectors. A.A.D.

N74-25955# National Aeronautical Lab., Bangalore (India).
SOLID STATE CONSTANT TEMPERATURE ANEMOMETER FOR FLUID FLOW STUDIES
R. Parameswaraiah and V. SreedharaMurthy Nov. 1972 79 p refs
(NAL-TN-41) Avail: NTIS HC $7.00

Design and development of a solid state constant temperature anemometer system for use in fluid flow studies including mean and fluctuating flows, shock tube flows, atmospheric turbulence, skin friction measurements are described. The system consists of a sensor, a hot wire or hot film, which is held submerged in the flow to be measured and is arranged to be in one arm of a Wheatstone bridge circuit, other arms of which are standard resistances. This sensor is maintained at constant resistance and hence constant temperature by a feedback circuit which, based on the signal across the diagonal points of Bridge circuit, controls the Bridge supply voltage to keep the Bridge in perfect balance irrespective of changes imposed by flow on the heat loss from sensor. Supply voltage then becomes a measure of flow parameters past the sensor. A zero suppressor incorporated in the system, by allowing suppression of bridge supply voltage at noflow conditions, increases the accuracy in recording of the bridge voltage thus enhancing the resolution of the system for a given panel meter. A square wave generator provided with the system may be used in determining the frequency response of the anemometer system and sensor. Author

N74-25956*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW HIGH-SPEED SOLAR RADIO SPECTROGRAPH FOR METER AND DECAMETER WAVELENGTHS
Stephen R. Mosier and Joseph Fainberg May 1974 40 p refs
(NASA-TM-X-70658; X-693-74-126) Avail: NTIS HC $5.00 CSCL 14B

The design and characteristics of a high resolution, digital solar spectrograph are discussed. The spectrometer operates in the 10 to 80 MHz range. The primary considerations in the design of the spectrograph were: (1) optimun sensitivity, (2) wide dynamic range, (3) flexibility in time and frequency resolution, and (4) modern data handling techniques with a simple computer interface. Author

N74-25957*# Honeywell, Inc., Lexington, Mass. Radiation Center.
DEVELOPMENT AND PERFORMANCE OF IR DETECTORS IN THE 1.5 TO 2.4 MICROMETER REGION THAT OPERATE AT 240 K Final Report
Alice F. Chiang and Nancy C. Aldrich Nov. 1973 202 p refs
(Contract NAS5-21646)
(NASA-CR-139014) Avail: NTIS HC $13.25 CSCL 14B

High performance 1.5 to 2.4 micrometers (Hg,Cd)Te photodetectors for operating at 240 K or above are discussed. The detailed characterization of the detector with respect to detector temperature and background flux led to a development of an empirical model for minority carrier trapping. The concept of detective time constant is presented and successfully demonstrated by the four detectors delivered on this contract. An alternative approach is presented with the use of photovoltaic (Hg,Cd)Te detectors. Author

N74-25958# Gesellschaft fuer Mathematik und Datenverabeitung, Bonn (West Germany).
NUMERICAL TREATMENT OF THE SINGULAR INTEGRAL EQUATION FOR THE DETERMINATION OF ELECTRON DENSITY AND ELECTRIC FIELD STRENGTH OF ELECTRO-OPTICAL INSTRUMENTS [NUMERISCHE BEHANDLUNG DER SINGULAEREN INTEGRALGLEICHUNG ZUR BESTIMMUNG DER LADUNGSDICHTE UND FELDSTAERKE BEI ELEKTRONENOPTISCHEN INSTRUMENTEN]
Wolfgang Appelt 1973 41 p refs In GERMAN Sponsored by Bundesmin. fuer Forsch. und Technol. and Landesamt fuer Forsch. des Landes Nordrhein-Westfalen
(BMFT-GMD-68) Avail: NTIS HC $5.25

A numerical method to solve singular integral equations is presented. This method allows simple and fast computation of the electric field strength from the electron density of electron-optical instruments. The field strength is such a system can be calculated from the gradient of the potential. The potential is determined by a partial second order differential equation which is difficult to treat for random edges. The electron density is therefore determined on the electrodes from which the potential and the field strength can be calculated by integration. This means solving a Fredholm first order integral equation with singular core and singular solution by numerical means. ESRO

N74-25959# Physics Lab. RVO-TNO, The Hague (Netherlands).
THE ACCURACY OF THE SOUND PATH INDICATOR BATHANY [DE NAUWKEURIGHEID VAN DE BATHANY

GELUIDSBAANINDICATOR]
M. J. VandeScheur Oct. 1973 24 p refs In DUTCH; ENGLISH summary
(PhL-1973-41; TDCK-62842) Avail: NTIS HC $4.25

The quality of the traces produced by Bathany ray tracing equipment has been analysed. It appears that the method of tracing leads to sufficiently accurate traces. Results which were reported to give a false indication of the ray pattern are ascribed to errors in the interpretation of the sound-velocity profile.
Author (ESRO)

N74-25960# Physics Lab. RVO-TNO, The Hague (Netherlands).
FLUTTER AND SKEW COMPENSATION OF AN ANALOG RECORDING SYSTEM FOR UNDERWATER ACOUSTIC SIGNALS
M. R. DeHaan Dec. 1973 83 p refs
(PhL-1973-52; TDCK-63441) Avail: NTIS HC $7.25

Method which permits an accurate digital analysis of analog recorded signals is presented. This method consists of recording a reference-signal together with the signal to be analyzed on the same track in order to be able to compensate for 'skew' and 'flutter'. In carrying out this method, special attention had to be paid to the design of the required filters, in particular to 'null-networks' with constant delay. The complete system was submitted to sea trials in the North Sea. The acoustic signals were registered satisfactorily. Some sample results are presented.
Author (ESRO)

N74-25961# Physics Lab. RVO-TNO, The Hague (Netherlands).
RADAR GROUND RETURNS. PART 3: FURTHER MEASUREMENTS ON THE RADAR BACKSCATTER OF VEGETATION AND SOILS
G. P. DeLoor Mar. 1974 38 p refs
(PhL-1974-05-PT-3; TDCK-64135-PT-3) Avail: NTIS HC $5.00

Measurements of the radar backscatter coefficient gamma of single vegetation species, woods, and bare soils are reported. It is shown that in the measuring set-up used all samples investigated contained sufficient scatterers to give a Rayleigh distribution at the output and that the decorrelation time is sufficiently short to obtain an adequate number of uncorrelated samples in one measurement. In SLAR observations the r.b.c. gamma as a function of frequency and polarization is the only possible classifier for vegetation species. Its total variation, however, is small approximately and requires, as a consequence, a fairly high accuracy in the measurements when variations in r.b.c. gamma are also to be used as an indicator for variations in biomass, plant vigor, moisture content, etc. Author (ESRO)

N74-25962# Technisch Physisch Dienst TNO-TH, Delft (Netherlands). Afdeling Optiek.
SOME TECHNIQUES FOR CONTRAST ENHANCEMENT, 1972 - 1973 [ENKELE TECHNIEKEN VAN CONTRASTVERBETERING OVERZICHT ONDERZOEK 1972/1973]
E. Sies and J. H. J. A. Degen 22 Jan. 1974 56 p In DUTCH; ENGLISH summary
(TPD-1974-0-1; TDCK-64246) Avail: NTIS HC $6.00

Several methods of post facto contrast enhancement are described. Some methods were studied experimentally, other methods only in theory. Experiments show good results for copying on contour-film (although it is rather time consuming) and for viewing by a closed TV-circuit. Viewing by a closed TV-circuit reveals no hidden information but makes interpretation easier. The most promising method of contrast enhancement seems to be the 'Fourier filtering method'. Literature shows spectacular examples of restoration of pictures degraded by motion blur, but the amount of motion blur in these pictures was known exactly. The possibilities of restoration under unknown (i.e. field) conditions are proposed as an object for further study.
Author (ESRO)

N74-25963# Naval Research Lab., Orlando, Fla. Underwater Sound Reference Div.
TWENTY YEARS OF UNDERWATER ELECTROACOUSTIC STANDARDS
I. D. Groves, Jr. 21 Feb. 1974 138 p refs
(RF11121403)
(AD-776214; NRL-7735) Avail: NTIS CSCL 17/1

The report is intended as a ready reference concerning the standard underwater sound transducers stocked by the Underwater Sound Reference Division. It also summarizes a few of the highlights of many years spent in investigating materials, design, and construction techniques to satisfy the requirements of widely varying underwater sound measurement problems. Twenty-nine appendices present descriptions and performance characteristics of as many individual transducer types. Author (GRA)

N74-25964# Army Foreign Science and Technology Center, Charlottesville, Va.
COMPARISON OF TWO PHOTOELECTRIC DEVICES FOR DETERMINING SIZES AND CONCENTRATIONS OF AEROSOL PARTICLES
A. G. Laktionov 8 Nov. 1973 10 p refs Transl. into ENGLISH from Tr. Inst. Prikl. Geofiz. (Leningrad), no. 7, 1967 p 67-73
(AD-776160; FSTC-HT-23-1732-72) Avail: NTIS CSCL 14/2

Device one collects light scattered by particles at right angles to direction of their illumination; device two collects light scattered by particles in direction near that of particle illumination. After oil droplet calibration of both devices, it was found that in the r = 0.6 micrometer region of drop radii, amplitudes of outgoing impulses from both devices are proportional to squares of sizes of particles. In the range from 20 to 0.6 micrometer the signal-to-noise ratio is 14 times greater in device two than device one.
GRA

N74-25965# Air Force Armament Lab., Eglin AFB, Fla.
INSTRUMENTATION CONSIDERATIONS FOR THE EXTRACTION OF AERODYNAMIC COEFFICIENTS FROM FREE FLIGHT DATA Final Report, May - Dec. 1973
Gerald Solomon Jan. 1974 91 p refs
(AF Proj. 2069)
(AD-776820; AFATL-TR-74-29) Avail: NTIS CSCL 20/4

An error analysis method developed from weighted nonlinear least squares estimation techniques is applied to the extraction of aerodynamic coefficients from free flight data. The error analysis method developed may be used to assess the effects of instrumentation errors on the estimates of the extracted aerodynamic coefficients. The weighting matrix utilized is the inverse of the measurement error covariance matrix. The matrix of sensitivity coefficients used in the estimation process is shown to be functionally dependent upon the quantities measured. A method is developed whereby a single set of parametric differential equations may be used in determining the sensitivity matrix, regardless of the instrumentation arrangement. Six degrees of freedom equations of motion, the theory of simple motion measuring devices, and some aspects of least squares estimation are reviewed.
Author (GRA)

N74-25966# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THREE-DIRECTIONAL LOAD TRANSDUCER Final Report, 21 Apr. - 21 Jul. 1972
Anthony R. Clemente, Richard Madden, James B. Blackwell, and Paul J. Remington Apr. 1973 39 p refs
(Contract DAAG17-72-C-0116; DA Proj. 1G7-62713-DJ-40)
(AD-776356; BBN-2538; USA-NLABS-TR-74-28-GP) Avail: NTIS CSCL 14/2

The report describes a three-directional load transducer to be used for measuring loads in tent tie downs. Included in the report are mechanical descriptions of the parts of the transducer and their functions, a method for determining approximate transducer sensitivity, a discussion of bridge wiring, calibration procedures, and the results of the calibration. An appendix presents raw calibration data. Author (GRA)

N74-25967# Army Aeromedical Research Lab., Fort Rucker, Ala.
STATIC EVALUATION OF ABSOLUTE ALTIMETER DISPLAY DESIGN, STUDY 1
Thomas L. Frezell, Donald F. Harden, Paul D. Hunt, and Mark A. Hofmann Feb. 1974 24 p refs
(DA Proj. 3A0-62110-A-819)
(AD-776345; USAARL-74-9) Avail: NTIS CSCL 01/4

Six absolute altimeter display designs were evaluated in the static mode. Performance was measured with respect to subjects' reading accuracy, speed and preference. The subjects consisted of experienced Army aviators and non-flying college students.

The results showed a significant difference between display types as well as between aviators and students. Author (GRA)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-25968* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INSERT FACING TOOL Patent
William J. Abernathy and Lowell G. Snoddy, inventors (to NASA) Issued 28 May 1974 4 p Filed 2 Aug. 1972 Supersedes N72-31490 (10 - 22, p 2971)
(NASA-Case-MFS-21485-1; US-Patent-3,813,183; US-Patent-Appl-SN-277436; US-Patent-Class-408-80; US-Patent-Class-408-111; US-Patent-Class-90-12.5) Avail: US Patent Office CSCL 13I

A manually actuated tool for facing the exposed end of an insert installed in a honeycomb panel is described. Several cutting bits are held in a round body portion that is rotated around the end of a stud to provide the cutting action. Pressure is adjusted through a spring against the body portion and the surface of the stud by a pressure nut threaded on the stud. A diagram of the components of the device is provided.
Official Gazette of the U.S. Patent Office

N74-25969 Engineering Sciences Data Unit, London (England).
EFFECT OF INCLINED NUT SEATINGS ON THE FATIGUE STRENGTH OF STEEL SCREW THREADS (TENTATIVE)
Mar. 1974 7 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-67034-Amend-A) Copyright. Avail: Issuing Activity

A method for estimating the effect of an inclined nut seating on the fatigue strength of a steel screw thread is presented. The method is based on an equivalent stress cycle which would produce the same endurance if the screw thread were loaded axially. The form of the relation between equivalent and nominal stresses is derived from a simplified elastic theory. Curves are presented corresponding with estimates of the best and worst conditions. Author

N74-25970# Joint Publications Research Service, Arlington, Va.
TECHNOLOGY OF MANUFACTURING HYDROACOUSTIC APPARATUS
A. G. Rabinovich and L. A. Rubanov 16 May 1974 117 p Transl. into ENGLISH from the book "Tekhnologiya Proizvodstva Gidroakusticheskoy Apparatury" Leningrad, Izdatelstvo Sudostroyeniye, 1973 p 86-135, 151-216
(JPRS-62013) Avail: NTIS HC $9.00

The manufacturing technology for hydroacoustic assemblies and apparatus is described. Author

N74-25971*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A MULTITARGET SEQUENTIAL SPUTTERING APPARATUS Patent Application
Rindge Shima, inventor (to NASA) (JPL) Issued 22 Apr. 1974 22 p
(Contract NAS7-100)
(NASA-Case-NPO-13345-1; US-Patent-Appl-SN-462705) Avail: NTIS HC $4.25 CSCL 13H

A sputtering apparatus includes a single cathode on which a plurality of targets of different materials are supported, with a rotatable anode, supporting a substrate and/or substrates, spaced apart from the cathode in a chamber containing an inert gas at a selected pressure. A potential difference is applied between the cathode and anode to produce a plasma for each target, which is sputtered by accelerated ions within the plasma. Apertured plates and shields are positioned between the targets and the anode to effectively separate the plasmas into separate columns. The sputtered material from each target having access to the substrate/substrates only through that target's column. NASA

N74-25972# Lincoln Lab., Mass. Inst. of Tech., Lexington.
METALLO-CERAMIC MACHINING ELECTRODE OF HIGH DURABILITY
Yu. N. Semenov and A. A. Tupakhin Jan. 1973 7 p refs Transl. into ENGLISH from Elektron. Obrab. Mater. (USSR), no. 6, 1971 p 75-78
(NTC-74-11899) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The characteristics of erosion resistant electrode materials are discussed. The chemical composition and hardness of electrodes of various aluminum alloys are tabulated. The effect of abrasion resistance on the machining of electrodes is analyzed. The factors considered are: (1) machining regimes, (2) relative electrode erosion, and (3) machining output. It was determined that the copper-baron nitride materials was most suitable from the standpoint of durability and output. Author

N74-25973# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ION BOMBARDMENT: INVESTIGATION OF THE SPUTTERING RATE AND APPLICATION TO THE ALTERATION OF A PROFILE
J. P. Ducommun Apr. 1973 52 p refs Transl. into ENGLISH of Paris Univ., Lab. des Materiaux, report, 1972
(NTC-74-50413; Rept-73-115) Avail: NTIS HC $5.75

The principal phenomena and characteristic factors of sputtering processes are discussed. The parameters considered are the speed of sputtering and the yield. These parameters allow a mathematical investigation of the alteration of a surface under ion bombardment. The operation of the apparatus is explained. The applications of polishing the surfaces and thinning the samples, preparation of the surfaces, and ion etching are investigated. The results of measurements of the speed and yield of sputtering for various materials under specified experimental conditions are presented. Author

N74-25974# Lincoln Lab., Mass. Inst. of Tech., Lexington.
REFRIGERATION, DESIGN AND APPLICATION OF CRYOPUMPS
F. X. Eder, H. Wossner, and M. Auwarter, ed. Jan. 1973 29 p refs Transl. into ENGLISH of the book "Ergebnisse derHochvakuumtechnik und der Physik dunner Schichten, Vol. 2" Stuttgart, Wissenschaftliche Verlagsgesellschaft mbH, 1971 p 348-364
(NTC-74-50418; Rept-73-32) Avail: NTIS HC $4.50

The amount of heat which has to be removed from the condensation surface and the baffle is on the order of 1 watt at 20 K and 15 Watts at 80 K for a pumping speed of 10,000 litres per second. The most efficient concept for a cryopump is the integration of the pumping screens and a refrigeration unit. This achieves the required cold production with highest reliability, compact and low weight construction and any installation position. Among the various possible refrigeration cycles, the following are considered: (1) Brayton helium cycle including two expansion engines at 20 K and 80 K, and heat exchangers; (2) Claude hydrogen cycle with only one expansion engine at medium temperature and partial liquifaction of the working gas; and (3) Gifford-McMahon cycles applying thermal regenerators and displacers without external, and displacers without external work, and very simple construction in which valves and highpressure seals are at room temperature. Author

N74-25975*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC-SCANNING-ELECTRON-MICROSCOPE STUDY OF FRICTION AND WEAR
William A. Brainard and Donald H. Buckley Washington Jun. 1974 25 p refs
(NASA-TN-D-7700; E-7913) Avail: NTIS HC $3.00 CSCL 14B

A friction and wear apparatus was built into a real time scanning electron microscope (SEM). The apparatus and SEM comprise a system which provides the capability of performing dynamic friction and wear experiments in situ. When the system is used in conjunction with dispersive X-ray analysis, a wide range of information on the wearing process can be obtained. The type of wear and variation with speed, load, and time can be investigated. The source, size, and distribution of wear particles can be determined and metallic transferal observed. Some typical results obtained with aluminum, copper, and iron specimens are given. Author

N74-25976*# National Aeronautics and Space Administration, Washington, D.C.
WELDING TECHNOLOGY
[1974] 43 p
(NASA-SP-5918(02)) Avail: NTIS HC $3.25 CSCL 13M

Welding processes which have been developed during NASA space program activities are discussed. The subjects considered are: (1) welding with an electron gun, (2) technology of welding special alloys, and (3) welding shop techniques and equipment. The material presented is part of the combined efforts of NASA and the Small Business Administration to provide technology transfer of space-related developments to the benefit of commercial organizations. P.N.F.

N74-25977# Unilever Research, Vlaardingen (Netherlands).
ADHESION OF COLLOIDAL PARTICLES
J. Visser [1973] 119 p refs Submitted for publication
Avail: NTIS HC $9.00

The work presented shows that the development of experimental methods for determining adhesion forces in vacuo in the non-retarded case, has reached a high degree of sophistication. The measuring results obtained can be interpreted quantitatively in terms of Van der Waals forces of adhesion and in ion-bonding forces. The additional effects playing a part in adhesion, such as the role of thin layers, anisotropy, humidity etc. can now be studied in greater detail, although these aspects are still far from solved. Experimental methods for determining the adhesion forces in a quantitative way for immersed systems have not yet been developed. The author's work gives a semi-quantitative picture of the factors governing adhesion in water and is particularly concerned with the adhesion of colloidal particles to a flat surface, woich is determined by Van der Waals forces of attraction and electrostatic forces of repulsion. Author (ESRO)

N74-25978# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
CLOSING TIMES OF THE ABG AIR SHOCK VALVE OF 130 mm DIAMETER FOR SEVERAL SHOCK WAVE LOADS [SLUITTIJDEN VAN DE LUCHTSCHOKKLEP DIAMETER 130 (ABG) BIJ VERSCHILLENDE SCHOKGOLFBELASTINGEN]
K. Coevert and C. C. J. M. Verspeek 4 Mar. 1974 7 p In DUTCH
(TL-1974-3; TDCK-64200) Avail: NTIS HC $4.00

An air shock valve has been designed in order to prevent the entry of shock waves in air intakes and outlets of shelters. The closing times of this valve were determined for different shock wave loads with peak overpressures up to 3 bar. The closing time has been defined as the time lag between the moment that the shock front passes the valve, and the moment the air intake is completely closed. The intake will only be completely closed for peak overpressures of more 0.05 bar. The closing time decreases from 30 ms for 0.06 bar overpressure to less than 3 ms for 3 bar overpressure. The valve is reusable for blast loads up to 3 bar overpressure. ESRO

N74-25979# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
A SURVEY OF FILTERS FOR COLLECTIVE PROTECTION CARRIED OUT BY 1 OCTOBER 1973 (A68/KM/079) [FILTERS VOOR COLLECTIEVE BESCHERMING. STAND VAN ZAKEN PER 1 OKTOBER 1973 (A68/KM/079)]
P. C. Stamperius 1973 13 p refs In DUTCH; ENGLISH summary
(CL-1973-27; TDCK-63695) Avail: NTIS HC $4.00

An annual survey of filters for collective protection is given. Attention is paid to an English initiative to standardize air filtration units for collective protection, to a U.S. self contained portable shelter system, to a method to remove noxious compounds from air by refrigeration, and the development of a rotary impaction filter. Author (ESRO)

N74-25980# Nederlands Scheeps-Studiecentrum TNO, Delft.
SOME EXPERIMENTS ON ONE-SIDE WELDING WITH VARIOUS BACKING MATERIALS. PART 1: MANUAL METAL ARC WELDING WITH COATED ELECTRODES AND SEMI-AUTOMATIC GAS SHIELDED ARC WELDING
J. M. Vink (Metaalinst. TNO) Sep. 1973 27 p In DUTCH; ENGLISH summary
(NSR-Mededel-31-S; TDCK-63357) Avail: NTIS HC $4.50

Only butt joints were taken into consideration and only manual welding methods with covered electrode and gas shielded metal arc welding were applied. The welding tests were performed with the weld in one of the following three positions: flat, horizontal and vertical welding. Backing systems of different materials were used. A series of selection tests was carried out to achieve those combinations of welding methods and backing which were suitable for further use. From these combinations the mechanical and physical properties were determined. Author (ESRO)

N74-25981# Aeroprojects, Inc., West Chester, Pa.
DEVELOPMENT OF AN ULTRASONICALLY AUGMENTED DIFFUSION BONDING PROCESS FOR FLUIDIC CONTROL ASSEMBLY FABRICATION Final Report
John G. Thomas Feb. 1974 24 p refs
(Contract DAAA21-73-C-0243)
(AD-775921; RR-74-1) Avail: NTIS CSCL 13/7

For initial investigations into the feasibility of augmenting the diffusion bonding of titanium fluidic control devices, a flexural-beam configuration was designed and fabricated, on the basis of intensive study of the mechanisms of the diffusion bonding process and the candidate modes of ultrasonic activation. Design problems were encountered, however, in achieving efficient ultrasonic power transmission with this activation mode. In order to achieve a workable system within reasonable time, an alternate arrangement comprising a flexural wedge-reed (shear-mode) ultrasonic system of proven design was fabricated. Effective performance of this equipment was confirmed by lightly bonding simulated fluidic control devices consisting of thirty 1-inch squares of 0.005-inch-thick aluminum at room temperature, using a clamping pressure of approximately 1000 psi and an ultrasonic pulse time of 0.6 second. A vacuum chamber to contain this equipment and appropriate heating apparatus were also designed and fabricated, to provide a complete functional system. Author (GRA)

N74-25982# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
IMPROVED CABLE FIRE PROTECTION Final Technical Report
Jan. 1974 41 p refs
(Contract N00024-74-C-5083)
(AD-775936) Avail: NTIS CSCL 13/12

Fires aboard naval ships, especially aircraft carriers, and specifically fires in passageways, have been propagated through bulkheads into adjoining passageways and compartments. The propagation of fires has been traced in many instances to burning of the electrical power, lighting and communication round wire cables that are mounted in cable runs and bundles overhead. This study has three areas of investigation, cable insulation and jacketing, protective coatings and coverings, and methods of testing for fire and flame resistance. The study is to consider short-term solutions that are applicable to ships presently operating in the fleet and long-term solutions applicable to future design and construction. GRA

N74-25983# Naval Ship Research and Development Center, Bethesda, Md.
HYDRODYNAMIC DESIGN PRINCIPLES OF PUMPS AND DUCTING FOR WATERJET PROPULSION
George F. Wislicenus Jun. 1973 176 p refs
(AD-775620; NSRDC-3990) Avail: NTIS CSCL 13/11

The purpose of the report on the special form of hydrodynamic propulsion known as waterjet propulsion is to make the viewpoint of a pump designer known to the developers of waterjet devices. More specifically, it is concerned with the contribution that the pump designer can make in order to give the designer of the entire propulsion plant the greatest possible freedom to find and use the most favorable overall arrangement. There is no attempt to cover the entire field of waterjet propulsion. Moreover, only aspects of preliminary design are considered because it is in this stage of development that irreparable mistakes can be made. Following an outline of the principal problems involved in the propulsion of high-speed surface craft, the design principles of hydrodynamic (centrifugal and axial flow) pumps are described and later applied to the design of waterjet propulsion pumps. The intake and duct problem is then described and designs are illustrated for a few typical overall arrangements. (Modified author abstract) GRA

N74-25984# Naval Ordnance Station, Louisville, Ky.
THERMO AND PLASMA FLAME SPRAY PROCESSES Final Report
Oct. 1973 59 p
(AD-776578; NOSL-MT-016) Avail: NTIS CSCL 13/8

The report presents a brief description of the wire, thermo and plasma spray processes and their respective applicabilities in the repair of Naval Ordnance Station, Louisville, for using thermo and plasma spray processes and the equipment and facilities installed. Included is information pertaining to familiarization of personnel with the processes, safety and environmental protection, product quality and cost savings, together with examples of procedures and standards adopted to ensure responsible control. (Modified author abstract) GRA

N74-25985# AiResearch Mfg. Co., Phoenix, Ariz.
INVESTIGATION OF THE FEASIBILITY OF FABRICATING BIMETALLIC COEXTRUDED GEARS Final Report, 1 Jun. 1972 - 31 Aug. 1973
K. M. Johansen Dec. 1973 153 p refs
(Contract F33615-72-C-1764)
(AD-776795; Rept-73-210355; AFAPL-TR-73-112) Avail: NTIS CSCL 13/9

The objective of this program was to demonstrate the feasibility of fabricating aircraft-quality bimetallic gears by the coextrusion process. Several material combinations (couples) were considered. M50 and 4330V modified were selected for the gear tooth cladding and core, respectively, on the basis of (1) acceptable material properties of each after having been subjected to a compatible heat treatment, and (2) demonstrated compatibility, residual compressive stress, and high-quality bond when coextruded in small, round-rod bars. Although some difficulty was encountered in the attempts to maintain the required geometric control, small spur gears (23-tooth, 18-diametrical-pitch) were successfully fabricated with a nominal cladding (M50) thickness of 0.015 inch. (Modified author abstract) GRA

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-25986 Tennessee Univ., Knoxville.
DESIGN CONSIDERATION OF THE PROTOTYPE PARTICULATE INSTRUMENTATION BY LASER LIGHT SCATTERING (PILLS 3) SYSTEM Ph.D. Thesis
Yasuo Watanbe 1973 107 p
Avail: Univ. Microfilms Order No. 74-11297

The design considerations, optical bench tests and prototype results of an electro-optical instrument for in-situ measurements of particulate density distribution utilizing the phenomenon of laser light scattering by single particles are discussed. The principal objectives of this system are: (1) accurate determination of particle diameters ranging from several micrometers to several hundreds of micrometers, with minimum signal dependence on the particle composition, and (2) presentation of an optically-defined, external sampling volume of the order of one cubic centimeter to an airflow with minimum dependence on the location of singly-sampled particles. The approach to these objectives was to design an in-line optical configuration in order to collect the forward scattered lobe, and to design an external sampling volume of large axial length. Dissert. Abstr.

N74-25987 Illinois Univ., Urbana.
SINGLELINE OPERATION OF A HIGH POWER CARBON MONOXIDE CHEMICAL LASER Ph.D. Thesis
Yasuo Hirose 1973 138 p
Avail: Univ. Microfilms Order No. 74-12042

This work represents an attempt to interpret the singleline operation of a high power longitudinal CO chemical laser system using the reaction of O + CS2 which normally operates on multiline vibration-rotation transitions of CO. This singleline operation was observed under certain operating conditions with no frequency selective elements in the laser cavity. It is suggested that the operating conditions cause the CO-CO vibration-vibration collisional energy exchange processes to compete with stimulated emission to yield singleline operation. Experimental data and results of computations on a laser model are presented to support this suggestion. Dissert. Abstr.

N74-25988 Ohio State Univ., Columbus.
DESIGN AND DEVELOPMENT OF A CO LASER AND INTERPRETATION OF ITS INFRARED SPECTRA Ph.D. Thesis
Won Byung Roh 1973 127 p
Avail: Univ. Microfilms Order No. 74-11038

A Q-switched, liquid nitrogen cooled CO laser was designed and constructed to enable the study of its spectrum with a high resolution vacuum infrared grating spectrograph. The lasing conditions were optimized to observe transitions between levels $v=3$ to $v=37$. The CO laser lines were measured relative to accurately known CO2 laser lines excited in the same laser tube. The spectral positions determined are average values of many repetitions. Dissert. Abstr.

N74-25989 California Univ., Los Angeles.
THE TRIFLUOROMETHYL BROMIDE LASER AND ITS APPLICATION IN TIME RESOLVED GAIN STUDIES Ph.D. Thesis
James David Campbell 1974 320 p
Avail: Univ. Microfilms Order No. 74-11601

A laser gain technique was developed and applied to determine the gain profiles for CF3Br, C2F5Br, and C3F7Br. The measured gains were reproducible to within several per cent. The accumulated gain data revealed the presence of an acoustic disturbance in the amplifier tube which appeared to originate in the flash annulus. Propagation of the disturbance across the amplifier in all likelihood results in changes in the physical properties of the active medium and manifests itself as oscillations in the gain profiles. Nevertheless, the data appeared to agree with an analysis which assumed that deactivation of 2P(1/2)Br by the parent compound is the most important process occurring within the amplifier at probing times closely following flash termination. Dissert. Abstr.

N74-25990 Illinois Univ., Urbana.
INDIUM GALLIUM ARSENIDE AND INDIUM ARSENIDE PHOSPHIDE INJECTION LASERS AND RADIATIVE RECOMBINATION IN NITROGEN-ZINC-DOPED GALLIUM ARSENIDE PHOSPHIDE Ph.D. Thesis
Joe Charles Campbell 1973 128 p
Avail: Univ. Microfilms Order No. 74-11966

Two problems relevant to electroluminescent devices are investigated. Prior to obtaining improved performance from laser diodes, it has been necessary to develop new crystal synthesis techniques. Difficulties inherent to synthesis of these III-V compound ternary alloys are discussed and it is concluded that crystal growth must occur at constant temperature. Two methods of crystal synthesis are explained. Laser operation at temperatures higher than 77K and consequent heat-sinking considerations are described. Dissert. Abstr.

N74-25991+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands).
A LASER BIBLIOGRAPHY, JANUARY 1967 - JANUARY 1972
P. H. Delil, comp. Sep. 1972 158 p refs Partly in ENGLISH; partly in FRENCH; partly in GERMAN; and partly in DUTCH
(TDCK-60760) Avail: NTIS HC $11.00

A bibliography is presented on lasers and laser applications, covering the period January 1967 to January 1972, and containing 349 references with abstracts. ESRO

N74-25992*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER MEASUREMENTS OF THE RADIATIVE LIFETIME

OF THE B STATE OF CN
W. M. Jackson May 1974 25 p refs Submitted for publication
(NASA-TM-X-70662; X-691-74-151) Avail: NTIS HC $4.25 CSCL 20E

A turnable dye laser was used to measure the radiative lifetime of the individual rotational levels of the B2 Sigma (+) state of CN. The radiative lifetime of the unperturbed rotational levels is 65.6 plus or minus 1.0 nsec. A longer radiative lifetime of 72 plus or minus 1 nsec is observed for the Kaon prime = 4 level of the B state. The measured values of the perturbed and unperturbed levels support the longer lifetimes for the A2 meson pion state of CN. The quenching cross section of the B2 Sigma state of CN is 41 plus or minus 20 Angstroms squared and is independent of the rotational energy of the B state. Author

N74-25993# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONSTRUCTION OF A LASER AMPLIFIER WITH A POWER REACHING 50 MW AT 3371A IN MOLECULAR NITROGEN
J. P. Girardeau-Montaut, M. Roumy et al Mar. 1973 5 p refs Transl. into ENGLISH from Compt. Rend. Acad. Sci. Paris (Paris), v. 274, no. 9, 1972 p 607-610
(NTC-74-11891; Rept-73-105) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A high power laser amplifier was developed using the results from a series of experiments on the transversal electronic pumping of molecular nitrogen. Experimental results obtained using 1 m and 0.5 m laser cells show the gain in amplification to be 20 db and the emission duration to be on the order of 2 ns. Author

N74-25994# Lincoln Lab., Mass. Inst. of Tech., Lexington.
STABILIZATION OF THE FREQUENCY OF A CO2 LASER WITH THE HELP OF AN SF6 EXTERNAL, MOLECULAR, LINEARLY ABSORBING CELL
O. N. Kompanets, A. R. Kukudzhanov et al May 1973 20 p refs Transl. into ENGLISH of Acad. of Sci. (USSR), Moscow, Report Preprint-5, 1972
(NTC-74-50408; Rept-73-135; Preprint-5) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A method is proposed for stabilizing the frequency of a CO2 laser according to narrow resonances in the absorption line with absorption saturation of SF6 in an external, low pressure Molecular cell. The relative frequency stability of two independently stabilized CO2 lasers is 3 X 10 to the minus 11th power over the course of 10 minutes. Measurements were also made of upper limit frequency shifts of the vibrational-rotational transition of the SF6 molecule cause by collisions. An alalysis was made of the factors which influence instability of the laser frequency under the conditions of the experiment and ways of improving the stability and reproducibility of the laser frequency are suggested. Author

N74-25995# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FREQUENCY FLUCTUATIONS IN A GAS LASER WITH NONLINEAR ABSORPTION
V. S. Letokhov and B. D. Pavlik May 1973 20 p refs Transl. into ENGLISH of Acad. of Sci. (USSR), Moscow, report Preprint-4, 1972
(NTC-74-50407; Rept-73-136; Preprint-4) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A theoretical discussion of the technical fluctuations in the frequency of a gas laser with nonlinear absorption is presented. The spectrum of laser frequency fluctuations with automatic frequency fine tuning operating in a frequency auto-stabilized regime is calculated. It was determined that frequency instability with respect to time is a function of the averaging time, the time constant of the automatic frequency fine tuning circuit, and the factor of nonlinear frequency pulling. A system for stabilizing the frequency of a laser wath two nonlinearly absorbing cells is described. Author

N74-25996# Physics Lab. RVO-TNO, The Hague (Netherlands).
PERFORMANCE OF A NEODYMIUM-GLASS LASER RANGEFINDER AT REDUCED OUTPUT POWER [BEREIK VAN EEN NEODYMIUM-GLAS LASERAFSTANDSMETER MET GEREDUCEERD VERMOGEN]
E. H. Lysen Oct. 1973 16 p ref In DUTCH; ENGLISH summary
(PhL-1973-45; TDCK-62897) Avail: NTIS HC $4.00

Some experimental and theoretical data were obtained with a neodymium-glass laser rangefinder to learn its performance at reduced power output, e.g. between 5 and 500 kWatt. The safe viewing distance is shortened in this way from 8 km at the unattenuated 3 MWatt output to distances between 0.3 and 3 km. Moreover, the probability of false alarms is reduced considerably. Author (ESRO)

N74-25997# International Laser Systems, Inc., Orlando, Fla.
Nd YAG 0.5320-MICRON FREQUENCY DOUBLING STUDY Final Report, Jan. - Sep. 1973
Frederick C. Way, Alfred T. Zavodny, and Robert M. Pixton Mar. 1974 165 p refs
(Contract F29601-73-C-0044; AF Proj. 3326)
(AD-776071; AFWL-TR-73-227) Avail: NTIS CSCL 20/5

The study is concerned with three major areas of study and analysis. The first is an in-depth experimental investigation of Second Harmonic Generation (SHG) crystals (CD*A and RDP) at repetition rates between 5 and 50 pps at input levels of 1.06 micron energy of up to 1.5 joules/ pulse. The second is a theoretical investigation of the propagation of a 0.5320-micron beam through the atmosphere for various conditions and slant ranges to determine the maximum energy density attainable at a 10.0-km range when the energy is focused by external optics. The third is the demonstration of a breadboard laser system capable of 500-mj/pulse of 0.5320 micron energy at the 10 pps level and the conceptual design of an advanced and improved laser system capable of producing maximum frequency doubled energy density at a 10.0-km range at the 10 pps repetition rate. (Modified author abstract) GRA

N74-25998# Quantum Systems, Inc., Albuquerque, N.Mex.
THEORETICAL FOUNDATION FOR A GENERAL QUANTAL MOLECULAR REACTION RATE CODE. VOLUME 1: GENERAL FORMULATION AND REVIEW OF VIBRATIONAL RELAXATION THEORIES AND MEASUREMENTS Final Report, 22 May - 9 Dec. 1973
Stephan Ormondo Feb. 1974 32 p refs
(Contract F29601-72-C-0116: AF Proj. 3326)
(AD-775734; AFWL-TR-73-235-Vol-1) Avail: NTIS CSCL 07/4

The research examined the possible foundations for the development of a general molecular reaction rate code for use in laser modeling work. Volume I is devoted to a survey of some experimental and theoretical results, familiarity with which, it was felt, would be of value in defining the physical and computational elements to be incorporated in an ab initio modeling code. The survey was contained somewhat by restricting it to articles concerned with reactions involving energy transfer processes in gases most frequently used in chemical lasers based on the halides. The basic data base consisting of measurements of molecular relaxation rates and theories ranging from semiempirical to quantal with illustrative examples is reviewed and summarized. GRA

N74-25999# Xonics, Inc., Van Nuys, Calif.
THEORETICAL STUDIES OF HIGH-POWER INFRARED WINDOW MATERIALS Technical Report, 30 Jun. - 6 Dec. 1973
Marshall S. Sparks and C. J. Duthler 6 Dec. 1973 263 p refs
(Contract DAHC15-73-C-0127; ARPA Order 1969)
(AD-775649; TR-2) Avail: NTIS CSCL 20/5

Contents: Extrinsic absorption; very high-intensity effects; high-power 2-6 micrometer and 10.6 micrometer window-material figures of merit with edge cooling and surface absorption included; explicit exponential frequency dependence of multiphonon infrared absorption; quasiselection rule for infrared absorption by NaCl-structure crystals; the absorption coefficient of alkali halides in the multiphonon regime: effects of nonlinear dipole moments; vertex corrections for multiphonon absorption; and, negligible effects. GRA

N74-26000# Hughes Research Labs., Malibu, Calif.
FREQUENCY TUNED CO2 LASER Interim Technical Report, 1 Oct. - 31 Dec. 1973
R. L. Abrams Mar. 1974 59 p refs
(Contract N00014-73-C-0324)
(AD-775656) Avail: NTIS CSCL 20/5

The program represents an effort to develop a stable, tunable CO2 laser with a tuning range of plus or minus 750 MHz. In order to increase the tuning range of a CO2 laser beyond the 50 to 100 MHz Doppler broadening limited value, it is necessary to increase the gain linewidth. The technical approach taken here is to raise the operating laser pressure and thus broaden the gain linewidth. The linewidth broadens at the rate of 5.3 MHz/torr and equals 1500 MHz at 283 torr. High pressure operation is achieved by operating the laser in the waveguide mode, and thus using a small capillary bore as the gas discharge region. (Modified author abstract) GRA

N74-26001# Radio Corp. of America, Princeton, N.J.
MATERIALS FOR PHASE HOLOGRAPHIC STORAGE
D. L. Staebler, W. Phillips, W. Burke, and R. W. Faughnan Feb. 1974 47 p refs
(Contract N00019-73-C-0273)
(AD-776275; PRRL-74-CR-3) Avail: NTIS CSCL 14/5

Fe-doped LiNbO3, when heated to elevated temperature, can be used for multiple storage of fixed holograms. The report describes recent advances in the preparation and characterization of this material. Included are tailoring of oxidation/reduction treatments for the preparation of crystals suitable for multiple storage, and measurements of the resistivity, recording range, and write/erase asymmetry of these crystals at elevated temperatures. The results suggest areas of research necessary for improved understanding and performance. In work on other materials, holograms were recorded for the first time in photochromic LiNbO3. Also, theoretical and experimental analyses of various electro-optic materials were carried out to show that Fe-doped LiNbO3 remains the prime candidate for high-capacity archival storage. Author (GRA)

N74-26002# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRO-IONIZATION LASERS
N. G. Basov, E. M. Belenov, V. A. Danilychev, O. M. Kerimov, I. B. Kovsh, A. S. Podsosniy, and A. F. Suchkov 20 Feb. 1974 32 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 64, no. 1, 1973 p 108-121
(AD-775782; FTD-HT-23-471-74) Avail: NTIS CSCL 20/5

This is a study of the electro-ionization method of exciting the working media of gas lasers. The conductance of a dense gas medium is created by ionizing radiation from an external source which, by passing an electrical current through the gas, permits the transformation of its energy into energy for exciting the working levels of the molecules. It discusses the mechanism of introducing energy into the active medium of an electro-ionization gas laser and the excitation of the laser working levels. It presents the experimental results of studies on an electro-ionization CO2 laser operating at CO2:N2He mixture pressures of up to 50 atm. GRA

N74-26003# Army Foreign Science and Technology Center, Charlottesville, Va. Foreign Technology Div.
HIGH PRESSURE GAS LASER WITH PREIONIZATION BY REACTOR
V. M. Andriyakhin, E. P. Velikhov, V. V. Vasiltsov, S. S. Krasilnikov, and V. D. Pismennyi 27 Dec. 1973 8 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz., Pisma Red. (USSR), v. 15, no. 11, 5 Jun. 1972 p 637-639
(AD-776109; FSTC-HT-23-299-73) Avail: NTIS CSCL 20/5

A nuclear reactor has already been employed as a source of ionization of gas in a considerable volume (approximately 750 cc) at a pressure close to atmospheric in experiments on immediate excitation of generation in a Hg - He3 mixture. This paper reports about experiments on combined excitation of a CO2 laser conducted on the same reactor (flow density of thermal neutrons in the central channel D approximately 5 x 10 to the 16th power neutrons/sq cm-sec, pulse length about 1 msec). GRA

N74-26004# Aerospace Corp., El Segundo, Calif.
LASER ACTINOMETRY OF FLASH PHOTOLYZED H2/F2He MIXTURES Technical Report, Jan. - Jun. 1973
Steven N. Suchard and David G. Sutton 30 Oct. 1973 21 p refs
(Contract F04701-73-C-0074)
(AD-775742; TR-0074(4641)-5; SAMSO-TR-74-57) Avail: NTIS CSCL 07/4

Actinometric and time-to-threshold experiments with flash-initiated H2/F2/He mixtures have been modeled with the RESALE chemical laser code. Comparison of the salient features of both experiments with those predicted by the code determines the efficiency of the xenon flashlamp in dissociating F2. (Modified author abstract) GRA

N74-26005# Raytheon Co., Waltham, Mass. Research Div.
VISIBLE INFRARED LASER-INDUCED DAMAGE TO TRANSPARENT MATERIALS Final Report, 1 Jan. - 31 Dec. 1973
David W. Fradin, Michael Bass, Domenic P. Bua, and Lowell H. Holway, Jr. Jan. 1974 155 p refs
(Contract F19628-73-C-0127; ARPA Order 1434)
(AD-776804; S-1660; AFCRL-TR-74-0082) Avail: NTIS CSCL 20/5

The basic objectives of this program was to analyze data obtained from carefully controlled damage measurements at laser wavelengths between 0.69 and 10.6 micrometers and at various laser pulse durations. The effort was divided into six major areas: They were (1) design and assembly of a pulsed CO2 TEA laser for use in 10.6 micrometer damage measurements, (2) a study of the effects of lattice disorder, polycrystallinity, alloying, and atomic impurity doping on intrinsic damage fields, (3) measurements of the dependence of intrinsic breakdown fields on laser pulse duration, (4) bulk and thin film optical damage from inclusion absorption, (5) the relationship between self-focusing and optical damage, and (6) analytical studies of laser-induced electron avalanche breakdown. GRA

N74-26006# Aerospace Corp., El Segundo, Calif.
SMALL SIGNAL GAIN AND TIME RESOLVED SPECTROSCOPY OF THE D2-F2/CO2 PULSED CHEMICAL TRANSFER LASER SYSTEM Technical Report, Mar. - Apr. 1972
Steven N. Suchard 15 Mar. 1974 15 p refs
(Contract F04701-73-C-0074)
(AD-776805; TR-0074(4641)-4; SAMSO-TR-74-56) Avail: NTIS CSCL 07/4

The authors report measurements of the small-signal-gain and time-resolved spectral output of a flash-initiated D2-F2/CO2 chemical transfer laser system. Small-signal-gain measurements indicate a possible lack of rotational equilibration among the rotational levels of the CO2 during the DF-CO2 v-v energy transfer process. Time-resolved spectral output of this system, operated as a laser oscillator, is presented as verification of the small-signal-gain results. (Modified author abstract) GRA

N74-26007# Army Foreign Science and Technology Center, Charlottesville, Va.
FREQUENCY STABILIZATION OF A RING LASER
N. G. Basov, E. M. Belenov, M. I. Volnov, M. A. Gubin, and V. V. Nikitin 7 Nov. 1973 6 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 15, no. 11, 1972 p 659-661
(AD-776564; FSTC-HT-23-300-73) Avail: NTIS CSCL 20/5

The use of resonances of the power of lasers that fix the central frequency of atomic or molecular transitions is discussed. The experimental assembly consists of two identical ring helium-neon lasers with an interior methane absorbing cell. The method for conducting the frequency measurement are explained. A diagram of the experimental arrangement is provided. Author

N74-26008# Hughes Research Labs., Malibu, Calif.
COHERENT OPTICAL ADAPTIVE TECHNIQUES (COAT) Technical Report, 26 Jun. - 26 Sep. 1973
S. Hansen, L. S. Horwitz, R. M. Kubo, S. P. Lazzara, and T. R. OMeara Oct. 1973 91 p refs
(Contract F30602-73-C-0248; ARPA Order 1279)
(AD-776814; RADC-TR-74-38; TR-2) Avail: NTIS CSCL

17/8

The report covers the fabrication phase of an experimental program to design, fabricate and evaluate an eighteen-element, self-adaptive, laser phased array. Computer simulation efforts were extended to aid in designing system electronics and in analyzing servo-loop performance for rapid glint selection and adaptive array focusing. The hardware configurations for the beamsplitter-mirror assembly (Phasor matrix), electronics and receiver/transmitter channels are described in this report along with the construction progress of the multiglint target hardware and propagation range instrumentation. A revised calibration and measurements program is described which reflects a 3-month delay in the completion of system electronics. Author (GRA)

N74-26009# Hughes Research Labs., Malibu, Calif.
PLASMA CATHODE FOR E-BEAM LASERS Semiannual Technical Report, 1 Jun. - 31 Dec. 1973
John R. Bayless Mar. 1974 44 p refs
(Contract N00014-72-C-0496; ARPA Order 1807)
(AD-776597) Avail: NTIS CSCL 20/5

The objective of this program is to develop a new type of plasma cathode electron gun and to demonstrate that it has properties suitable for operation with E-beam lasers. This device employs a plasma generated within a low-voltage hollow cathode discharge rather than a thermionic emitter as the source of electrons. Electrons extracted from the plasma pass through a triode-type control grid structure and are accelerated to high energies in a plasma-free region prior to emerging from the gun through a thin foil window. The device is characterized by ruggedness, low cost, low power consumption, and fast response in comparison to thermionic cathode E-guns. (Modified author abstract) GRA

N74-26010# Naval Research Lab., Washington, D.C.
ELECTROMAGNETIC FIELD IN A LASER RESONATOR Interim Report, Sep. 1972 - Sep. 1973
William H. Carter 11 Mar. 1974 38 p refs
(AD-776541; NRL-7663) Avail: NTIS CSCL 20/5

A new theory has been formulated whereby the electromagnetic field inside resonator filled with an active medium is described through an expansion of the field into an angular spectrum of plane waves. The resonator is composed of two identical, circular reflectors of arbitrary size, focal length, and axial separation and contains an isotropic, homogeneous, saturable amplifying medium. This theory properly accounts for the vector properties of the field, is not limited by the usual paraxial approximations, and provides integral expressions for the spatial distribution of the field over the interior of the resonator in three dimensions. The expression for the transverse electric component of the field was evaluated numerically for several of the lower loss modes in confocal, spherical, and unstable resonators with linear dimensions the order of 10 wavelengths. These data indicate that some of the modes in confocal and spherical resonators are unstable, if the resonator has dimensions of a few wavelengths. The effect on the spatial distribution of the resonator field due to saturation of the amplifying medium is slight if spatial hole burning is neglected. The electromagnetic field given by this theory was also quantized, and the resulting formulation resembles the quantum theory for radiation in a closed resonator.
Author (GRA)

N74-26011# RAND Corp., Santa Monica, Calif.
PHYSICAL PRINCIPLES, MATERIALS GUIDELINES, AND MATERIALS LISTS FOR HIGH-POWER 10.6 MICROMETER WINDOWS
Marshall Sparks Sep. 1973 59 p refs
(Contract F44620-73-C-0011)
(AD-776818; R-863-PR) Avail: NTIS CSCL 20/5

No materials available when this research was performed were useful for 10.6-micron laser windows at the power levels and beam diameters of interest. Some available materials were too weak structurally, whereas other, strong enough, tended to distort the beam when they absorbed its heat. This report discusses the problems and the physical principles underlying them. It sets up guidelines for the search for, and the selection of, suitable materials. Then, by using these guidelines and the figures of merit already established, along with the known properties of a few materials, the author isolates a narrow choice of materials for early experimental investigation. Author (GRA)

N74-26012# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
LASER DAMAGE IN MATERIALS Final Technical Report, 1 Jan. 1972 - 31 Dec. 1973
Albert Feldman, Deane Horowitz, and Roy M. Waxler Mar. 1974 17 p refs
(ARPA Order 2016; NBS Proj. 3130440)
(AD-776337; NBSIR-74-458) Avail: NTIS CSCL 20/5

The report summarizes the study of damage and self-focusing in materials used in Q-switch solid-state laser systems. In borosilicate crown glass, fused silica, dense flint glass, and yttrium aluminum garnet, self-focusing appears to be the main cause of damage. An analysis of damage threshold measurements with linearly polarized radiation and circularly polarized radiation suggests that the Kerr effect is the dominant self-focusing mechanism with a significant contribution to self-focusing from the thermal effect. The electrostrictive effect is negligible. The damage threshold in Nd:doped laser glasses appears to be intrinsic. In all the above materials, the damage threshold for circular polarization is greater than the damage threshold for linear polarization. In lithium niobate, calcite, potassium dihydrogen phosphate, and deuterated dihydrogen phosphate, damage at the lowest levels is caused by inclusions. Bulk and surface damage thresholds in nd:doped thoria:yttrium oxide ceramic are obtained relative to bulk damage thresholds in several optical materials. Relationships under different geometric boundary conditions are also derived for solid materials between the stress-optic coefficients and the electrostrictive coefficients. Author (GRA)

N74-26013# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROWAVE EXCITATION OF LASER GASES M.S. Thesis
David R. Durham Mar. 1974 103 p refs
(AD-776349; GEP/PH/74-5) Avail: NTIS CSCL 20/9

The goal of this experiment was the creation of large numbers of electrons and helium (12 triplet S) metastables through the use of four microwave cavity discharges. The desire for gas ionization independent of the exciting field stems (1) from the increased efficiency available when lower exciting fields can be used, and (2) from the stabilizing effect of independent electron density control. The desire for helium metastable production stems from (1) additional electron creation via Penning ionization in a helium afterglow, and (2) increased metal-vapor laser pumping efficiency. The effective increase of the recombination coefficient due to electron cooling by added nitrogen was shown. The discovery of negative absorption of the 3889A line in a pure helium afterglow was made. (Modified author abstract) GRA

N74-26014# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE POSSIBILITY OF DEVELOPING PULSE GAS LASERS WITH PUMPING BY AN ELECTRON BEAM IN AN ELECTRIC FIELD
Yu. V. Afanasev, E. M. Belenov, O. V. Bogdankevich, V. A. Danilychev, S. G. Darznik, and A. F. Suchkov 8 Mar. 1974 10 p refs Transl. into ENGLISH from Vyosokomol. Soedin. (Moscow), no. 11, Nov. 1970 p 23-27
(AD-776748; FTD-HT-23-716-74) Avail: NTIS CSCL 20/5

A report is given concerning the possibility of developing pulse gas lasers with combined excitation when the pumping of the gas is produced simultaneously by an electron beam in an electric field. The proposed method of excitation fundamentally allows obtaining the high radiation power of laser owing to the uniform excitation at high pressures of large gas volumes. The role of the electron beam is reduced actually to the creation of conditions for a streamerless development of a discharge, and the excitation energy comes basically from the external electric field. GRA

N74-26015# Army Electronics Command, Fort Monmouth, N.J.
DEGRADATION OF A HELIUM-NEON LASER BEAM BY ATMOSPHERIC DUST DURING A SAND STORM
A. J. Blanco, E. M. DArcy, and J. B. Gillespie Mar. 1974 14 p ref

(DA Proj. 1T0-61101-A-91A)
(AD-776909; ECOM-5535) Avail: NTIS CSCL 20/6

Simultaneous measurements of scattered laser energy (6328A) and atmospheric particle concentration within three size ranges were made to determine the distribution of scattered energy as a function of angle and particulate concentration. A high number concentration was provided by a short but intense sand storm which fortuitously passed through the array during the experiment. Single and multiple regression techniques were applied to data taken at the peak of the storm and to that taken after it had subsided. Experimental results were used to derive empirical models in estimating the scattered energy distribution under both high and low background levels of particulate concentrations. Author (GRA)

N74-26016# United Aircraft Corp., East Hartford, Conn. Research Labs.
MICROWAVE MODULATION OF CO2 LASERS IN Ga-As THIN FILM OPTICAL WAVEGUIDES Semiannual Technical Report, 25 Sep. 1973 - 25 Mar. 1974
P. K. Cheo, M. Gilden, D. Fradin, and R. Wagner 29 Mar. 1974 66 p refs
(Contract N00014-73-C-0087; ARPA Order 1860)
(AD-776663; UARL-N921513-6; SATR-3) Avail: NTIS CSCL 20/5

The long-range objective of this program is to develop an efficient and reliable ultra-wideband thin-film modulator for CO2 lasers that will be useful for high-resolution, imaging optical radars and high-data-rate optical communication systems. During the present reporting period (September 26, 1973 to Mar. 25, 1974), the goal of this program is the demonstration of efficient sideband generation at microwave frequencies (X-band or Ku-band) from the 10.6 micrometer CO2 molecular resonance. For the remaining contractual period (March 26, 1974 to June 25, 1974), the goal is to experimentally demonstrate the generation of frequency-chirped 10.6 micrometer CO2 laser waveforms using the microwave-driven thin-film modulator developed under the present contract. Characteristics of the frequency chirped optical signals, sideband power limitations and total optical insertion loss of the microwave-driven thin-film modulator will be investigated. In particular, techniques for improving coupling efficiency of both optical and microwave power will be determined. GRA

N74-26017# Isomet Corp., Oakland, N.J. Devices Engineering Dept.
DEVELOPMENT OF A FLYABLE ACOUSTO-OPTIC LASER BEAM DEFLECTION SYSTEM FOR A HEAD UP DISPLAY OF THE FUTURE Final Report, May 1972 - Aug. 1973
Harmon Aronson and Richard Stolzenberger 9 Nov. 1973 39 p
(Contract N62269-72-C-0439)
(AD-776653; Rept-074A) Avail: NTIS CSCL 20E

The report describes a laser display which is to be used in a Head-Up Display of the future. The uniqueness of the display is that it uses acousto-optic components for the modulation and deflection of the laser beam. As a result, there are no moving parts, which increases the reliability and life expectancy of the equipment. The display uses red light from a He-Ne laser and projects it on a 4 x 4 inch screen with a resolution of 500 x 500 spots (Rayleigh criteria). The system was designed for stroke writing but was demonstrated with lissajous writing. The acousto-optic deflectors employed special features. Two deflectors were used for each axis of scan to eliminate spot focusing and defocusing during scanning. Each deflector used acoustic beam steering to maximize deflection efficiency, maintain deflection uniformity over the deflection range and minimize drive power. Author (GRA)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-26018 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON THE RELATIONSHIP BETWEEN ATOMIC VIBRATION AMPLITUDE AND THERMAL EXPANSION FOR Ag, Al, Au, Cu, Fe, AND Ni
V. Hovi (Turku Univ.) and P. Mutikainen (Turku Univ.) 1974 11 p refs
(ISBN-951-41-0145-6) Copyright. Avail: Issuing Activity

The relationship between the mean-square atomic vibration amplitude and the thermal expansion for cubic solids was investigated in the case of cubic metals Ag, Al, Au, Cu, Fe, and Ni. The consideration is based only on experimental data. The formula previously obtained for that relationship in the case of alkali halides turned out to be well valid especially for Au and Cu at all temperatures. For Ag, Al, Fe, and Ni the equation is useful within a slightly restricted temperature range. Author

N74-26019 Ohio State Univ., Columbus.
FLOW AND FRACTURE OF TYPE 304 AUSTENITIC STAINLESS STEEL BAR AND WELDMENTS Ph.D. Thesis
Edward Neil Cliff Dalder 1973 232 p
Avail: Univ. Microfilms Order No. 74-10939

Type 304 austenitic stainless steel bar and welded plate, the former in the solution--annealed and sensitized conditions, the latter in the as-welded condition, were evaluated for propensity towards localization of plastic flow in torsion. Testing was conducted over the temperature: strain-rate envelope 75F-1200F (24C-649C): 0.07 per minute to 4.8 per minute. Results indicate that fracture-initiation in all cases was associated with the formation of voids at second-phase: austenite interfaces. Fracture-propagation in the majority of cases involved macroscopic localization-flow on planes of maximum shear-strain and subsequent separation on one of these planes. Fracture-propagation in the few cases that did coalescence of voids by microscopically-thin localization of plastic flow between voids. In all cases, fracture-propagation required continued plastic-straining, indicating that fracture occurred by the stable mode. Dissert. Abstr.

N74-26020 Illinois Univ., Chicago.
A STUDY OF THE EFFECTS OF HIGH-TEMPERATURE, HIGH-PRESSURE HYDROGEN ON LOW-ALLOY STEELS Ph.D. Thesis
Olimpio Francisco Angeles, Jr. 1973 167 p
Avail: Univ. Microfilms Order No. 74-10376

Hydrogen attack phenomenon in low-alloy steels and, other aspects of hydrogen effects on low-alloy steels at high temperatures and high pressure were considered. It is accepted that the hydrogen attack reaction is the combination of hydrogen, present at high pressures in the pre-existing microvoids in the steel, with carbon in solution to produce non-diffusing methane which expands the voids of fissures. The dynamic exposure technique, an experimental situation where a sustained hydrogen gradient is maintained, was used to evaluate the susceptibility to hydrogen attack of low-alloy steels containing up to 1% molybdenum and up to 2 1/4% chromium. The experiments were conducted at 2000 psig hydrogen pressure and 900 to 1000 F. The different alloys were heat treated in different ways and the carbides formed were extracted and analyzed. Dissert. Abstr.

N74-26021# Bureau of Mines, College Park, Md. Metallurgy Research Center.
RAPID IDENTIFICATION OF COPPER-BASE ALLOYS BY ENERGY DISPERSION X-RAY ANALYSIS
Harold E. Marr, III 1974 18 p refs
(BM-RI-7878) Avail: NTIS HC $4.00

Energy dispersion X-ray analysis was evaluated for possible application in the secondary metals industries for the rapid analysis and identification of copper-base alloys. Laboratory investigations of standard brass and bronze samples indicate that X-ray methods are capable of separating standard alloys into 10 general classes with analytical times of less than 3 seconds per sample for clean, flat samples. A radioactive source of americium 241 with a secondary fluorescer was used as an excitation source, and a lithium-drifted silicon semiconductor detector was utilized for energy discrimination of X-rays. Author

N74-26022*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EVALUATION OF CERMET MATERIALS SUITABLE FOR LITHIUM LUBRICATED THRUST BEARINGS FOR HIGH TEMPERATURE OPERATION
John H. Sinclair and William H. Hendrixson (GE, Cincinnati) Washington Jun. 1974 31 p refs
(NASA-TN-D-7655; E-7748) Avail: NTIS HC $3.25 CSCL 11F

Cerment materials (HfC - 10 wt% W; HfC - 10 wt% TaC - 10 wt%W; HfC - 2 wt% CbC - 8 wt% Mo;Hfn - 10 wt% W; Hfn - 10 wt% TaN - 10 wt% W; and ZrC - 17 wt% W) were evaluated for possible use as lithium-lubricated bearings in the control system of a nuclear reactor. Tests of compatibility with lithium were made in T-111 (Ta-8W-2Hf) capsules at temperatures up to 1090 C. The tendencies of HfC-TaC-W, HfC-CbC-Mo, and HfN-W to bond to themselves and to the refractory alloys T-111 and TZM when enclosed in lithium-filled capsules under a pressure of 2000 psi at 980 and 1200 C for 1933 hours were evaluated. Thermal expansion characteristics were determined for the same three materials from room temperature to 1200 C. On the basis of these tests, HfC-10 TaC-10W and HfN-10W were selected as the best and second best candidates, respectively, of the materials tested for the bearing application. Author

N74-26023*# Mar-Test, Inc., Cincinnati, Ohio.
HIGH-TEMPERATURE, LOW-CYCLE FATIGUE OF ADVANCED COPPER-BASE ALLOYS FOR ROCKET NOZZLES. PART 1: NARLOY Z Contractor Report, Jan. - Feb. 1974
J. B. Conway, R. H. Stentz, and J. T. Berling May 1974 52 p refs
(Contract NAS3-17777)
(NASA-CR-134627; MTI-R003-3-1) Avail: NTIS HC $5.75 CSCL 11D

Short-term tensile and low-cycle fatigue data are reported for Narloy Z, a centrifugally cast, copper-base alloy. Tensile tests were performed at room temperature in air and in argon at 482, 538 and 593 C using an axial strain rate of .002/sec to the -1 power. In addition tensile tests were performed at 538 C in an evaluation of tensile properties at strain rates of .004 and .01/sec to the -1 power. Ultimate and yield strength values of about 315 and 200 MN/sq m respectively were recorded at room temperature and these decreased to about 120 and 105 respectively as the temperature was increased to 593 C. Reduction in area values were recorded in the range from 40 to 50% with some indication of a minimum ductility point at 538 C. Author

N74-26024# National Environmental Research Center, Cincinnati, Ohio.
CYCLING AND CONTROL OF METALS
Marion G. Curry, comp. and Gilbert M. Gigliotti, comp. Feb. 1973 193 p refs Proc. of the Environ. Resources Conf., Columbus, Ohio, 31 Oct. - 2 Nov. 1972; sponsored by EPA, NSF and Battelle Mem. Inst.
Avail: NTIS HC $12.75

The proceedings of a conference on metals to investigate the problem of metals and their relationship to the environment are presented. The discussions involved transport and effects of metals, control processes, monitoring for trace metals, and the economic and legal aspects of pollution. Author

N74-26025*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A NICKEL BASE ALLOY, NASA WAZ-16, WITH POTENTIAL FOR GAS TURBINE STATOR VANE APPLICATION
William J. Waters and John C. Freche Washington Jun. 1974 27 p refs
(NASA-TN-D-7648; E-7920) Avail: NTIS HC $3.25 CSCL 11F

A nickel-base superalloy based on the nickel-aluminum-tungsten system designated WAZ-16 was developed for high strength in the 1095 C (2000 F) to 1205 C (2200 F) range. Its tensile strength at the latter temperature is approximately 186 MN/m2 (27,000 psi). The combination of properties of the alloy suggest that it has potential as a stator vane material in advanced gas turbine engines. Author

N74-26026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH TEMPERATURE MECHANICAL PROPERTIES OF A ZIRCONIUM-MODIFIED, PRECIPITATION-STRENGTHENED NICKEL, 30 PERCENT COPPER ALLOY
John D. Whittenberger Washington Jun. 1974 23 p refs
(NASA-TM-X-3065; E-7855) Avail: NTIS HC $3.00 CSCL 11F

A precipitation-strengthened Monel-type alloy has been developed through minor alloying additions of zirconium to a base Ni-30Cu alloy. The results of this exploratory study indicate that thermomechanical processing of a solution-treated Ni-30Cu-0.2Zr alloy produced a dispersion of precipitates. The precipitates have been tentatively identified as a Ni5Zr compound. A comparison of the mechanical properties, as determined by testing in air, of the zirconium-modified alloy to those of a Ni-30Cu alloy reveals that the precipitation-strengthened alloy has improved tensile properties to 1200 K and improved stress-rupture properties to 1100 K. The oxidation characteristics of the modified alloy appeared to be equivalent to those of the base Ni-30Cu alloy. Author

N74-26027*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREEP BEHAVIOR OF TANTALUM ALLOY T-222 AT 1365 TO 1700 K
Robert H. Titran Washington Jun. 1974 35 p refs
(NASA-TN-D-7673; E-7790) Avail: NTIS HC $3.25 CSCL 11F

High vacuum creep tests on the tantalum T-222 alloy at 0.42 to 0.52 T sub m show that the major portion of the creep curves, up to at least 1 percent strain, can be best described by an increasing creep rate, with strain varying linearly with time. Correlation and extrapolation of the creep curves on the basis of increasing creep rates results in more accurate engineering design data than would use of approximated linear rates. Based on increasing creep rates, the stress for 1 percent strain in 10,000 hours for T-222 is about four times greater than for the Ta-10W alloy. Increasing the grain size results in increased creep strength. Thermal aging prior to testing caused precipitation of the hexagonal close packed (Hf,Ta) sub 2 C, which initially increased creep strength. However, this dimetal carbide was converted during creep testing to face-centered cubic (Hf,Ta)C. Author

N74-26028# Aeronautical Research Labs., Melbourne (Australia).
STRESS CORROSION CRACKING OF A LOW CARBON ULTRA-HIGH STRENGTH STEEL IN HUMID ENVIRONMENTS
W. J. Pollock Oct. 1973 37 p refs
(ARL/Met-93) Avail: NTIS HC $5.00

Ultrasonic and visual techniques were used to monitor crack growth due to stress corrosion in pre-cracked, modified wedge-opening-loading specimens of steel samples. After short incubation periods, discontinuous crack propagation occurred in water vapor environments at 5 to 20 torr pressure at 295 K. It was determined that crack growth in a water vapor/oxygen mixture depended on the partial pressures of water vapor and oxygen and the stress intensity to which the cracks were loaded. The behavior is interpreted in terms of a model which relates the cracking characteristics to the local environment within the cracks, with particular reference to the conditions necessary for capillary condensation. The role of hydrogen in the propagation of localized regions of the crack front is discussed. Author

N74-26029# National Aeronautical Lab., Bangalore (India).
SERRATED FLOW IN QUENCHED DURALUMIN ALLOY
V. Srinivasian Dec. 1973 21 p refs
(NAL-TN-42) Avail: NTIS HC $4.25

A mathematical relationship between moving dislocations in duralumin alloy to show the effects of applied strain rate and test temperature is established. The time interval involved is that between the onset of plastic deformation and the appearance of the first serration. It is suggested that copper-magnesium pair with a migration energy of 0.33 eV causes necessary dislocation locking for the occurrence of serrated flow. Author

N74-26030*# Case Western Reserve Univ., Cleveland, Ohio. School of Engindering.
ELEVATED TEMPERATURE DEFORMATION OF THORIA DISPERSED NICKEL-CHROMIUM Annual Status Report,

Jun. 1974
R. D. Kane and L. J. Ebert Jun. 1974 106 p refs
(Grant NGR-36-003-094)
(NASA-CR-138504) Avail: NTIS HC $8.50 CSCL 11F

The deformation behavior of thoria nickel-chromium (TD-NiCr) was examined over the temperature range 593 C (1100 F) to 1260 C (2300 F) in tension and compression and at 1093 C (2000 F) in creep. Major emphasis was placed on: (1) the effects of the material and test related variables (grain size, temperature, stress and strain rate) on the deformation process; and (2) the evaluation of single crystal TD-NiCr material produced by a directional recrystallization process. Elevated temperature yield strength levels and creep activation enthalpies were found to increase with increasing grain size reaching maximum values for the single crystal TD-NiCr. Stress exponent of the steady state creep rate was also significantly higher for the single crystal TD-NiCr as compared to that determined for the polycrystalline materials. The elevated temperature deformation of TD-NiCr was analyzed in terms of two concurrent, parallel processes: diffusion controlled grain boundary sliding, and dislocation motion.
Author

N74-26031# Watervliet Arsenal, N.Y.

THE COMPRESSION AND TENSILE YIELD BEHAVIOR OF A COLD WORKED HIGH STRENGTH STEEL

Joseph J. Pepe Feb. 1974 25 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-776327; WVT-TR-74004) Avail: NTIS CSCL 11/6

A low alloy, quench and tempered high strength steel was cold worked various amounts up to 70% reduction in area by hydrostatic extrusion. The compressive offset yield strength of the cold worked material was significantly lowered due to the Bauschinger effect. These data were compared to the tensile yield behavior of this material similarly cold worked and indicated that the Bauschinger effect also altered the tensile yield behavior. With successively higher post-extrusion heat-treatments the Bauschinger effect was found to become smaller and could eventually be eliminated. The strength differential between the compression and tensile yield strengths of the unworked material disappeared after cold hydrostatic extrusion and post-extrusion tempering at 1000F.
Author (GRA)

N74-26032*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF INERT-GAS-FUSION AND MODIFIED KJELDAHL TECHNIQUES FOR DETERMINATION OF NITROGEN IN NIOBIUM ALLOYS

Emery J. Merkle, Judson W. Graab, and Warren F. Davis Washington Jun. 1974 16 p refs
(NASA-TM-X-3067; E-7867) Avail: NTIS HC $3.00 CSCL 11F

This report compares results obtained for the determination of nitrogen in a selected group of niobium-base alloys by the inert-gas-fusion and the Kjeldahl procedures. In the inert-gas-fusion procedure the sample is heated to approximately 2700 C in a helium atmosphere in a single-use graphite crucible. A platinum flux is used to facilitate melting of the sample. The Kjeldahl method consisted of a rapid decomposition with a mixture of hydrofluoric acid, phosphoric acid, and potassium chromate; distillation in the presence of sodium hydroxide; and highly sensitive spectrophotometry with nitroprusside-catalyzed indophenol. In the 30- to 80-ppm range, the relative standard deviation was 5 to 7 percent for the inert-gas-fusion procedure and 2 to 8 percent for the Kjeldahl procedure. The agreement of the nitrogen results obtained by the two techniques is considered satisfactory.
Author

N74-26033# Lincoln Lab., Mass. Inst. of Tech., Lexington.

ORBITAL PARAMAGNETISM AND MAGNETIC ANISOTROPY OF TRANSITION METALS

F. Ducastelle and F. Cyrot-Lackmann May 1973 8 p refs Transl. into ENGLISH from J. Phys. Colloq. (Paris), v. 1, 1971 p CL-536-CL-538
(NTC-74-11878; Rept-73-142) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The orbital paramagnetism and its anisotropy, and the magnetic anisotropy of ferromagnetic metals are studied in a tight-binding scheme, using an expansion of the density of states in its moments. It is shown that the sign of the quantities related to the anisotropy change when filling the D band, and that these quantities depend on the value of the c/a ratio compared to the ideal value c/a = 1.63.
Author

N74-26034# British Aircraft Corp. (Operating) Ltd., Bristol (England).

A STUDY OF THE STRUCTURAL APPLICATIONS OF BERYLLIUM

T. E. H. Lemon and W. R. Newell Paris ESRO Jan. 1974 278 p
(Contract ESTEC-1553/71)
(ESRO-CR-209) Avail: NTIS HC $17.00

Data are presented on mechanical and physical properties, for a range of powderbased and wrought products. European facilities are described, a list of aerospace applications of beryllium is given along with an extensive bibliography. The bibliography covers the collection of technical and manufacturers' data that accompanies the master copy of the report. The structural and boom surveys indicate that beryllium can save as much as 35% of the mass of a spacecraft primary structure when compared with aluminum alloy and that an improvement in vibration frequencies can also be obtained. The cost study indicates that a beryllium design would cost five times as much as the conventional aluminum alloy equivalent. Several recommendations are given for further work.
Author (ESRO)

N74-26035# Defence Research Information Centre, Orpington (England).

ON THE FATIGUE BEHAVIOUR OF ADHESIVE JOINTS. PART 3: MATHEMATICAL-STATISTICAL EVALUATION

W. Spaeth Jan. 1974 22 p refs Transl. into ENGLISH from Adhaesion (Berlin), v. 12, 1972 p 416-424
(DRIC-Trans-3470; BR30740) Avail: NTIS HC $4.25

Variations in the fatigue behavior of adhesions were examined, the effect of notches considered, and a comparison between static and dynamic behavior made. The state of technology in the statistical evaluations is discussed, including cumulative frequency curves of specific adhesive surfaces, determination of statistical characteristics, and linearization of the cumulative curves. Practical questions regarding fracture probability, reliability, and safety are also discussed.
ESRO

N74-26036# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THERMAL RESPONSE CALCULATIONS AND THEIR ROLE IN THE DESIGN OF EXPERIMENTS

Peter J. Torvik Dec. 1973 54 p refs
(AD-775707; AFIT-TR-73-6; AU-6-73-AFIT/EN) Avail: NTIS CSCL 11/6

The prediction of temperatures and the times required for complete melt through in metal sheets subjected to continuous laser irradiation is considered. Analytical and numerical methods for predicting the thermal responses are discussed and applied so as to obtain general conclusions on the influence of radial conduction, vaporization, and melt removal mechanisms on the melt through time. Some results from a recent series of experiments are presented and interpreted. Absorptivities of bare titanium and stainless steel at two intensities, together with the absorptivities of painted samples of titanium, stainless steel, magnesium and aluminum are all determined by two methods and the results compared. A comparison between experimental and computed data suggests the presence of several interesting phenomena, worthy of further study. The data also suggests the possibility of sufficient energy being released due to the burning of paint to be of significance at laser intensities of one kilowatt per square centimeter, or less. (Modified author abstract)
GRA

N74-26037# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Physical and Engineering Metallurgy.

FRACTURE TOUGHNESS, AGING BEHAVIOR, GRAIN GROWTH, AND HARDNESS OF ALPHA-BETA TITANIUM ALLOYS Technical Report, 1 Mar. 1972 - 30 Apr. 1973

Harold Margolin, Ernest Levine, Morris Young, and Ira Greenhut Sep. 1973 159 p refs
(Contract F33615-72-C-1529; AF Proj. 7351)
(AD-775716; AFML-TR-73-172) Avail: NTIS CSCL 11/6

The fracture toughness of Ti-5.25Al-5.5V-0.9Fe-0.5Cu was studied for equiaxed alpha-aged beta structures heat treated to produce 0.2% yield stresses of 180,000 psi. The structure of Ti-6Al-2Sn-4Zr-6Mo was determined over a range of quenching and aging temperatures by X-ray and electron microscopy. Hardness was corrected with structure as a function of aging time. Methods of revealing grain size in a two-phase alpha-beta titanium alloy have been examined and observations on beta grain growth in the presence of alpha have been carried out. The hardness of grain boundary alpha was studied as a function of the thickness of alpha and the hardness of the beta matrix in a Ti-5.25Al-5.5V-0.9Fe-0.5 Cu alloy. (Modified author abstract) GRA

N74-26038# New Mexico Inst. of Mining and Technology, Socorro. Dept. of Metallurgical and Materials Engineering.
EFFECTS OF SHOCK LOADING ON YOUNG'S MODULUS OF LOW CARBON STEEL 1
Ching H. Ma and Donald T. C. Huo Mar. 1974 35 p refs
(Contract N00014-67-A-0267-0003)
(AD-775657; MT-74-6) Avail: NTIS CSCL 11/6

Changes in Young's modulus of fully annealed low carbon steel 1018 due to shock loading at 104 kbars and 304 kbars and the effects of subsequent low temperature isothermal annealing of the shock-loaded specimens are measured. The range of annealing temperature is 54T to 69C. Activation energies of point defects and average dislocation densities in the shock-loaded specimens are determined experimentally. An interpretation of the experimental results principally based on Motts defective modulus theory and the interactions of point defects with dislocations and grain boundaries is presented. Author (GRA)

N74-26039# Army Foreign Science and Technology Center, Charlottesville, Va.
SURVEY OF RESEARCH ON SUPERPLASTICITY: WORLD-WIDE
Roy H. Geiss and William F. Marley 20 Feb. 1974 38 p refs
(AD-775775; FSTC-CW-01-105-74) Avail: NTIS CSCL 11/6

The study reports on worldwide developments in the investigation of the phenomenon of superplasticity of materials. It summarizes the theoretical aspects of superplasticity as proposed by the foremost scientists in the field. Theories considered include: Nabarro-Herring creep, grain boundary diffusion, grain boundary sliding, dynamic recovery, and metastability. The study categorizes known superplastic metals and alloys, by presenting key properties such as optimum temperatures for superplasticity, percent elongations, and the strain rate sensitivity parameter. Attention is directed to the potential or known uses of superplastic materials. Author (GRA)

N74-26040# Naval Ship Research and Development Center, Annapolis, Md.
THE EFFECT OF FILLER METAL CHEMISTRY AND HEAT TREATMENT ON THE WELDABILITY OF THE Ti-6 Al-2.5 Mo ALLOY
Joseph L. Cavallaro Feb. 1974 69 p refs
(SF54541)
(AD-775599; NSRDC-4189; NSRDC-28-631) Avail: NTIS CSCL 11/6

Determination was made of the effects of combined variations in weld-metal chemistry and postweld heat treatment on the mechanical properties and sea-water stress-corrosion-cracking properties of Ti-6Al-2.5Mo weldments. The composition range studied included 4% to 7% aluminum and 0.5% to 2.5% molybdenum. Good fracture toughness and stress-corrosion-cracking resistance for weld metal in the Ti-Al-Mo-O alloy system are achieved at the 110,000 pounds per square inch yield strength level. No degradation of properties was produced in the heat-affected zone of Ti-6Al-2.5Mo weldments. The results of this investigation indicate that a tougher and more ductile Ti-100 alloy weldment could be developed through control of microstructure in the Ti-Al-Mo-O and Ti-Al-V-O alloy systems. (Modified author abstract) GRA

N74-26041# Naval Research Lab., Washington, D.C.
AUGER ELECTRON SPECTROSCOPY ANALYSIS OF THE FRACTURE SURFACES OF IRRADIATED PRESSURE-VESSEL STEELS Interim Report
F. A. Smidt, Jr., D. F. Stein, and A. Joshi 21 Dec. 1973 12 p refs
(RR0221141)
(AD-776540; NRL-7660) Avail: NTIS CSCL 11/6

Pressure-vessel steels and weldments containing the residual elements copper and phosphorus show a marked tendency toward embrittlement after irradiation at 290C. Auger electron spectroscopy was used to analyze fracture surfaces of these materials to ascertain if segregation of copper and phosphorus during irradiation was responsible for the embrittlement. No evidence of segregation was found. An alternative mechanism is suggested in which the residual elements modify the defect microstructure, with attendant increases in yield strength and ductile-to-brittle transition temperature. Author (GRA)

N74-26042# Air Force Weapons Lab., Kirtland AFB, N.Mex.
THE SURFACE ABSORPTION OF UNPAINTED ALLOYS AT 10.6 MICRONS Final Report, Aug. 1971 - Aug. 1973
Stephan S. Cunningham and William T. Laughlin Mar. 1974 35 p refs
(AF Proj. 317J)
(AD-776763; AFWL-TR-74-12) Avail: NTIS CSCL 11/6

The surface absorption of 10.6-micrometer radiation was measured for alloys of aluminum, magnesium, stainless steel, and titanium. Coupling coefficient data were taken from one- and two-dimensional heat flow experiments where there were a wide range of heating rates and temperatures achieved. The relative importance of some experimental variables in laser effects experiments such as beam intensity profile, aiming error, sample-to-sample surface variations, etc., have been determined. For the samples of titanium and stainless steel brought through their melting points no changes in coupling due to temperature or oxide formation wdre resolved. A dependence of coupling coefficient on beam intensity was observed for the stainless steel alloy. Author (GRA)

N74-26043# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
STRESS-VELOCITY RELATIONS FOR DISLOCATIONS IN NIOBIUM
R. P. Walson and H. K. Birnbaum Feb. 1974 21 p refs
(Contract N00014-67-A-0305-0020)
(AD-776621) Avail: NTIS CSCL 11/6

The stress-velocity relations for screw and mixed dislocations in high purity niobium were studied at 298K and 196K. Etch pitting methods were used to reveal the dislocation positions after stress pulses in tension and compression. Attention was particularly directed towards establishing any asymmetry in the motion of dislocations on the (112). No asymmetry was observed for either screw or mixed dislocations moving on the (112). The motion at 298K at low stresses was limited by extrinsic barriers while that at 196K and high stresses seemed limited by intrinsic dislocation drag. Author (GRA)

N74-26044# Battelle Columbus Labs., Ohio.
DETERMINATION OF THE FEASIBILITY OF USING BETA RADIATION BACKSCATTER FOR THE DETECTION OF SURFACE CONTAMINATION OF METAL PANELS
H. Gruber, Elmer J. Bradbury, Carl W. Melton, and Merle L. Rhoten 15 Mar. 1974 42 p
(Contract DAAJ0I-73-C-0858)
(AD-776394; USAAVSCOM-TR-73-31) Avail: NTIS CSCL 11/6

The beta backscatter technique was determined to be feasible for the measurement of contaminants and surface preparation coatings. Titanium and aluminum honeycomb panels with bonded and disbonded areas were examined to identify (1) contaminants or surface preparation properties which result in disbonding and (2) surface preparation coatings which result in acceptable bonds. The poor bonding of the titanium panels was between the metal skin and the primer coating. Electron microscopy showed that the surface of the titanium skin was too smooth to favor physical bonding. Further examination showed there were no bonded areas suitable for analysis. The skins of the aluminum panels showed the bonded areas exhibited a microetchpit structure which was not present in the poorly bonded areas. It was concluded that the lack of bond of the aluminum panels was not the result of surface contamination but rather a function of the pickling parameters and perhaps the annealing of the aluminum. Author (GRA)

N74-26045# Battelle Columbus Labs., Ohio.
FAST FRACTURE RESISTANCE AND CRACK ARREST IN STRUCTURAL STEELS Progress Report
G. T. Hahn, R. G. Hoagland, M. F. Kanninen, A. R. Rosenfield, and R. Sejnoha Jun. 1973 129 p refs
(Contract N00024-72-C-5142)
(AD-776986; SSC-242) Avail: NTIS CSCL 11/6

Measurements and calculations of unstable fracture and fracture arrest in 12.7 mm- and 25.4 mm-thick, high-strength SAE4340 steel and A517F steel plates are described. A fully dynamic analysis of unstable crack propagation and arrest in the DCB (double cantilever beam)-test piece is derived. The technique is based on the beam-on-elastic-foundation model of the DCB specimen used previously but with the simple beam and foundation representations replaced by a Timoshenko beam and a generalized elastic foundation. Crack speeds, energy levels, and the crack length at arrest are calculated with this model using finite-difference method and are compared with the measurements. The kinetic energy imparted to the test piece is recovered and contributes to the crack driving force. It follows from this that fracture arrest is controlled by the history of energy dissipation throughout the entire propagation event, rather than on Ka, a single static toughness value calculated at the arrest point. (Modified author abstract) GRA

N74-26046# Artech Corp., Falls Church, Va.
RESEARCH AND EXPLORATORY DEVELOPMENT ON THE FABRICATION AND CHARACTERIZATION OF FIBER REINFORCED LIGHT METAL ALLOY COMPOSITES Final Report, Apr. 1972 - Dec. 1973
P. J. Lare, Robert A. Hermann, and Henry Hahn Jan. 1974 42 p refs
(Contract N00017-72-C-4311)
(AD-776974; J7118-FR) Avail: NTIS CSCL 11/4

Discontinuous beta-SiC whiskers and chopped C filaments were used as a reinforcement for strengthening 7178 and 2024 Al alloys. The C fibers were coated with Cu to improve wetting. Tensile properties of a 25 v/o beta-SiC 2024 Al composite were increased three times over the matrix strength at room temperature and ten times at 800F. Tensile properties in the transverse direction were at least equal to the matrix strength at temperatures up to 800F. Ti-10V composites reinforced with SiC filaments were consolidated by activated pressure sintering. The samples produced were not fully dense. Consolidation temperature or time at temperature could not be increased since the reaction between the matrix and filaments would be too severe. GRA

N74-26047# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRON-BEAM MELTING AND REFINING OF METALS AND ALLOYS
B. E. Paton, ed. 7 Mar. 1974 272 p refs Transl. into ENGLISH of the publ. "Elektronnoluchevaya Plavka i Rafinirovanie Metallov i Splavov" USSR, 1973 p 1-239
(AD-776746; FTD-MT-24-26-74) Avail: NTIS CSCL 11/6

Contents: Investigation of the initial stage of formation of the spectrum of cloud drops; Investigation of local nonuniformities in microphysical characteristics of a fog; Results of experiments on modification of fog by condensation nuclei; Study of the diffusion of light aeroions on aerosol particles; Some results from investigation of the formation of the crystalline phase in a supercooled fog; New method for determining the concentration of the most active cloud condensation nuclei. GRA

N74-26048# Ohio State Univ. Research Foundation, Columbus.
PHASE TRANSFORMATIONS IN VAPOR-QUENCHED MOLYBDENUM AND MOLYBDENUM GOLD ALLOYS Final Report, 15 Mar. 1972 - 31 Oct. 1973
G. Pilkington, G. Antwi-Boateng, and G. Meyrick Feb. 1974 73 p refs
(Grants DA-ARO(D)-31-124-70-G72;
DA-ARO(D)-31-124-72-G133)
(AD-776970; AROD-8665-2-MC) Avail: NTIS CSCL 11/6

Thin films of Mo and of metastable single-phased Mo-Au alloys were prepared by vapor-quenching and subjected to a variety of aging treatments while their microstructural characteristics were studied by high resolution microscopy and through electric resistance measurements. When aged above 400 C the alloys transformed by a complex process which involved competition among internal precipitation, surface precipitation and evaporation of the gold. The transformation was associated with resistance changes that followed second order kinetics, and activation energies that tended to increase as the transformation progressed. Depending upon the quality of the vacuum and the temperature of deposition amorphous, fcc and bcc modifications of molybdenum were produced. Author (GRA)

N74-26049# Washington Univ., Seattle. Coll. of Engineering.
INFLUENCE OF STRESS, STRAIN AND STRAIN RATE ON DYNAMIC FRACTURE Final Report
Ian M. Fyfe and Douglas H. Polonis Jan. 1974 12 p refs
(Grants DA-ARO(D)-31-124-70-G91;
DA-ARO(D)-31-124-72-G126)
(AD-776400; AROD-9504-5-E) Avail: NTIS CSCL 11/6

The work presented in this report summarizes the results obtained from an examination of dynamic fracture in aluminum alloys under biaxial strain conditions. It is shown that the initiation of dynamic fracture is controlled by the maximum principal stress and the pulse duration. The geometry of the fracture surface is explained in terms of the nucleation of microcracks, and the extent of the fracture is strongly dependent on the aging treatment undergone by the alloy. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-26050 Wisconsin Univ., Madison.
ORIENTED DISCONTINUOUS ORGANIC-FIBER REINFORCED THERMOPLASTIC COMPOSITE MATERIALS Ph.D. Thesis
Bruce Frederick Blumentritt 1973 183 p
Avail: Univ. Microfilms Order No. 74-7457

Five thermoplastics, ranging in modulus from 23,000 psi to 380,000 psi, were used as composite matrices. In order of increasing modulus, the matrix materials used were ionomer, high density polyethylene, nylon 12, polycarbonate, and polymethyl methacrylate. The first four of these materials are ductile while PMMA is brittle. The reinforcements used were, in order of increasing modulus, nylon 6-6, polyethylene terephthalate, polyvinyl alcohol, and PRD-49. Tensile tests were performed to give values for tensile strength, tensile modulus, ultimate elongation, and fracture toughness of the experimental materials. In addition, shear strengths of the composites were determined using doublenotched test specimens. A torsion pendulum was used to measure shear moduli and damping factors of several materials over temperature ranges from minus 135 C to the softening temperatures of the matrices. Scanning electron microscopy was used to determine the composite fracture mode and to gain information about fiber to matrix adhesion. Dissert. Abstr.

N74-26051*# Pennsylvania State Univ., University Park.
ABSORPTION CHARACTERISTICS OF GLASS FIBER MATERIALS AT NORMAL AND OBLIQUE INCIDENCE M.S. Thesis
Barry R. Wyerman Jun. 1974 139 p refs
(Grants NGL-39-009-121; NSF GK-32584)
(NASA-CR-132451) Avail: NTIS HC $10.00 CSCL 11D

The absorption characteristics of several fibrous materials of the Owens Corning 700 Fiberglas Series were measured to determine the variation in impedance as a function of incident angle of the sound wave. The results, indicate that the fibrous absorbents behave as extended reacting materials. The poor agreement between measurement and theory for sound absorption based on the parameters of flow resistance and porosity indicates that this theory does not adequately predict the acoustic behavior of fibrous materials. A much better agreement with measured results is obtained for values calculated from the bulk acoustic parameters of the material. Author

N74-26052*# Washington Univ., Seattle. Dept. of Mining Metallurgical and Ceramic Engineering.
STRUCTURAL STUDIES ON CARBON MATERIALS FOR ADVANCED SPACE TECHNOLOGY. PART 1: STRUCTURE AND OXIDATION BEHAVIOR OF SOME CARBON/CARBON COMPOSITE MATERIALS Final Report, 15 Sep. 1971 - 31 May 1974
D. B. Fischbach, D. R. Uptegrove, and S. Srinivasagopalan 31 May 1974 48 p refs
(Grant NGR-48-002-129; NGL-48-002-004)
(NASA-CR-138506) Avail: NTIS HC $5.50 CSCL 11D

The microstructure and some microstructural effects of oxidation have been investigated for laminar carbon fiber cloth/cloth binder matrix composite materials. It was found that cloth wave is important in determining the macrostructure of the composites X-ray diffraction analysis showed that the composites were more graphitic than the constituent fiber phases, indicating a graphitic binder matrix phase. Various tests which were conducted to investigate specific properties of the material are described. It was learned that under the moderate temperature and oxidant flow conditions studied, C-700, 730 materials exhibit superior oxidation resistance primarily because of the inhibiting influence of the graphitized binder matrix. Author

N74-26053# Electrotechnical Lab., Tokyo (Japan).
THERMAL CONDUCTIVITY OF HIGH POLYMER MATERIALS
Katsuhiko Kanari Dec. 1973 109 p refs In JAPANESE; ENGLISH summary
(Circ-176) Avail: NTIS HC $8.50

Thermal conductivity of high polymers is discussed. Topics include outlines of research, measuring methods, the temperature and pressure dependence of thermal conductivity, the relation between thermal conductivity and the structure of high polymers, and specific conductivity data for polymers. Author

N74-26054# Defence Research Information Centre, Orpington (England).
THE SEPARATION OF GREASES INTO THEIR COMPONENT FRACTIONS BY EXTRACTION WITH 1,2,2-TRICHLORO-1,1,2-TRIFLUOROETHANE IN THE SOXHLET EXTRACTOR
A. Langanke Feb. 1974 5 p refs Transl. into ENGLISH from Erde u. Kohl, v. 25, no. 3, Mar. 1973 p 145-146
(DRIC-Trans-3515; BR30857) Avail: NTIS HC $4.00

A solvent extraction method for separating the oil and soap components from greases, using 1,2,2-trichloro-1,1,2-trifluoroethane as a solvent, is presented and discussed. The method leads to an efficient separation, giving components of high purity. ESRO

N74-26055# Unilever Research, Vlaardingen (Netherlands).
CONSTITUTIVE EQUATIONS APPLIED TO DISPERSED SYSTEMS
D. W. DeBruijne, N. J. Pitchard, and J. M. P. Papenhuijzen 1972 23 p refs In NEPALI Presented at the 6th Intern. Congr. on Rheology, Lyon, Sep. 1972 Submitted for publication
Avail: NTIS HC $4.25

It was investigated whether constitutive equations, which describe the rheological behavior of polymer-like materials, can be used to represent the rheology of dispersions. Such equations generally predict stresses that depend on both the shear and a quantity which is the product of the shear rate and the time constant of the material. Comparing the rheological behavior of dispersions of fat crystals in paraffin oil with the behavior predicted by the Bogue equation, it turns out that the Bogue equation has some success in representing the stress overshoot in steady shear experiments. The predicted value of the normal stress for the concentrated dispersions is too low in comparison with the measured value. It is suggested that this discrepancy is due to the dilatant behavior of these dispersions. The values of the dynamic moduli measured in oscillatory shear are predicted incorrectly. Author (ESRO)

N74-26056# European Space Research Organization, Paris (France).
INCREASE IN STRENGTH OF HEAT-RESISTANT ADHESIVE-BONDED METAL JOINTS BY COMBINING TWO ADHESIVES (ADHESIVE COMBINATION JOINT)
W. Althof Apr. 1974 69 p refs Transl. into ENGLISH of "Festigkeitssteigerung von waermebestaendigen Metallklebungen mit Hilfe von Klebschichten aus zwei Klebstoffen (Kombinationsklebung)", DFVLR, Inst. fuer Flugzeugbau, Brunswick, report DLR-FB-73-22, 1973 68 p
(ESRO-TT-45; DLR-FB-73-22) Avail: NTIS HC $6.50

The lap shear strength of a high temperature adhesive bonded joint was increased by an additional adhesive, which is more ductile than the high temperature adhesive. The magnitude of the strength increase and the corresponding parameters were investigated experimentally at room and elevated temperatures by static and fatigue tests. The joints consisted of aluminum and titanium adherents with various aircraft structural adhesives. The measurement of the shear stress distribution in lap joints showed the reason for the strength increase. Author (ESRO)

N74-26057# Naval Ship Research and Development Center, Bethesda, Md.
IMPACT TESTS OF URETHANE FOAM
Anthony J. Furio, Jr. and William E. Gilbert Jan. 1974 39 p refs
(ARPA Order 1676)
(AD-775903; NSRDC-4254) Avail: NTIS CSCL 01/3

The impact behavior of a low-density urethane foam was investigated experimentally, and the crushing characteristics of the rigid closed-cell foam were determined as a function of impact velocity, foam sample thickness, and temperature. The dynamic crushing strength of the material was found to be much better than its static strength. This energy-absorbing capability allows consideration of the foam as protection for the underbodies of Arctic surface effect vehicles (ASEV) against the impact of collisions. Author (GRA)

N74-26058# Washington Univ., St. Louis, Mo. Materials Research Lab.
THE GENERAL PLANE STRESS FAILURE OF BORON COMPOSITES, PART 1 Final Technical Report, 17 May 1971 - 15 Jun. 1972
B. R. Collins and R. L. Thomas Nov. 1973 147 p refs Prepared in cooperation with Hercules, Inc., Cumberland, Md.
(Contract F33615-71-C-1613; AF Proj. 7353)
(AD-775710; AFML-TR-73-173-Pt-1) Avail: NTIS CSCL 11/4

The behavior of a fiber reinforced composite subjected to a general biaxial stress state is discussed in terms of the experimental sensitivity required to precisely define the parameters of an assumed functional form of the limit surface. The experimental portion of the program characterized plate and tubular specimens of boron reinforced aluminum. The stress analysis for the potentially nonuniform stress states in the tubes are presented and it is concluded that the thin walled cylindrical tube is an ideal specimen for the intended characterization of this program. Off-axis tensile tests and other simple combined loading tests are shown to lack the appropriate sensitivity for the parametric evaluation of the limit surface functional form. The effects of repressing boron/aluminum plates and the sequential processing of tubes from various broadgood forms is shown to be either beneficial or deleterious depending on the total amount of processing at various fabrication parameters. (Modified author abstract) GRA

N74-26059# Washington Univ., St. Louis, Mo. Materials Research Lab.
THE GENERAL PLANE STRESS FAILURE OF BORON ALUMINUM COMPOSITES. PART 2: PHASE 1: THEORETICAL ANALYSIS OF CYLINDRICAL TUBES FOR CHARACTERIZATION OF BORON/ALUMINUM COMPOSITES. PHASE 2: PLASTICITY AND COMBINED LOADING ANALYSIS OF CYLINDRICAL TUBES FOR CHARACTERIZATION OF BORON/ALUMINUM COMPOSITES Final

Technical Report, 17 May 1971 - 15 Jun. 1972
A. A. Vicario, W. T. Freeman, and P. F. Stecher Nov. 1973 38 p refs Prepared in cooperation with Hercules, Inc., Cumberland, Md.
(Contract F33615-71-C-1613; AF Proj. 7353)
(AD-775712; AFML-TR-73-173-Pt-2) Avac: NTIS CSCL 11/4

Since the analysis of composites is based on the transformation theory associated with anisotropic elasticity, it is necessary to substantiate the theory with more general off-axis orientation; i.e. helically wrapped tubes and angle ply laminates. In these cases, as with its counterpart flat specimens, the effects of gripping may become substantially magnified. In addition, the t/D, L/D, and alpha parameters can significantly influence the accuracy of the subject test. The adequacy was studied of liminate theory in predicting off-axis elastic modulus compared to finite element simulation of the response of boron/aluminum tubes. Gripping effects and stress distribution uniformly are considered for anisotropic tube. The analysis that in the gage section boron/aluminum behaves essential as an isotropic material when t/D equal to or less than 0.05. Consequently, the simplifying assumptions of shell theory can be directly applied to their analysis. It is concluded that (1) failure in the grip section will be substantially less likely to occur than with bvron or graphite/epoxy system, (2) stresses will be nearly uniform in the gage section, and (3) only minor extraneous stress effects will be generated.
Author

N74-26060# Westinghouse Research Labs., Pittsburgh, Pa.
CRITERIA FOR CRACK EXTENSION AND ARREST IN RESIDUAL, LOCALIZED STRESS FIELDS ASSOCIATED SECOND PHASE PARTICLES
F. F. Lange 13 Feb. 1974 21 p refs
(Contract N00014-68-C-0323)
(AD-776190; Rept-74-9D4-KERAM-R1-TR-9) Avail: NTIS CSCL 11/2

An energy balance approach is taken to determine the conditions in which crack extension will occur within the highly-localized, residual stress field associated with second phase particles embedded within a matrix phase. The unique result of this analysis is that the particle size U is one of the factors that governs the criterion of crack instability. The maximum stress, the elastic properties of the two phases, the fracture energy of the cracked phase, and the size of the pre-existing crack are the other factors. (Modified author abstract) GRA

N74-26061# TRW, Inc., Cleveland, Ohio.
HIGH TEMPERATURE TITANIUM COMPOSITES Final Report, 1 Jul. 1971 - 30 Jun. 1973
William D. Brentnall and Istvan J. Toth Sep. 1973 142 p refs
(Contract F33610-71-C-1873; AF Proj. 7351)
(AD-775750; TRW-ER-7568; AFML-TR-73-223) Avail: NTIS CSCL 11/4

Titanium alloy matrix composites reinforced with 0.004 in. diameter silicon carbide and 0.010 in. diameter single crystal alpha AI2O3 (sapphire) continuous filaments were investigated. Conventional solid state press diffusion binping fabrication methods were used and a preliminary study to optimize fabrication parameters was made. Property evaluations included room and elevated temperature tensile, creep and stress rupture, thermal exposure, ballistic impact and shear strength tests. (Modified author abstract) GRA

N74-26062# Stanford Univ., Calif. Center for Materials Researchj
LONG RANGE MATDRIALS RESEARCH Semiannual Technical Report, 1 Jul. - 31 Dec. 1973
Robert A. Huggins 31 Dec. 1973 159 p refs
(Contract DAHC15-73-%-0015)
(AD-776240; CMR-74-2) Avail: NTIS CSCL 20/12

Contents: %eneration of coherent vacuum ultraviolet and soft △-ray radiation; Detection of X-radiation; Warm working and superplasticity of plain high carbon steels; Superplasticity of Fb-Sn and Fb-Sn-Au alloys; Synthesis of new types of catalyst materials; Pevelopment of elevated temperature electrocrystallization techniques. GRA

N74-26063# California Univ., Los Angeles. School of Engineering and Applied Science.
HIGH STRENGTH EUTECTIC COMPOSITES Final Report, 1 Jan. 1871 - 31 Mar. 1974
Alfred S. Yue 31 Mar. 1974 7 p refs
(Contract DA-ARO(D)-31-124-73-G94)
(AD-776412; AROD-9447-6-MC) Avail: NTIS CSCL 11/4

Fiberlike Ti-Ti5Ge3 eutectic composites were produced by electron-beam floating zone-melting. The volume fraction of the germanide fiber in the Ti-Ti5Ge3 eutectic mixtures was increased from 19.5 to 34% in agreement with theoretical predictions. The effects of freezing rate and temperature on the mechanical properties of the Ti Ti5Ge3 eutectic composites was investigated. It was found that the room temperature compression strength and tensile modulus were 325,000 psi and 26.5 x 10 to the sixth power psi. At temperatures less than 400C the average tensile strength was 150,000 psi. These properties were superior to any known commercial titanium alloys. The creep and fracture behaviors of these eutectic composites were studied as functions of freezing rate and temperature. In general, these behaviors were in good agreement with those reported from artificially-made fibdr-reinforced metal matrix composites. (Modified author abstract) GRA

N74-26064# Brown Univ., Providence, R.I. Engineering Materials Research Lab.
A 16-YEAR CREEP OF POLYETHYLENE ANP PVC
W. N. Findley ahp J. F. Tracy Nov. 1973 16 p refs
(Contract DAHC15-67-C-0217)
(AD-776326; MRL-E-88) Avail: NTIS CSCL 11/9

Creep tests at constant stress, temperature and relative humidity for two thermoplastics were conducted for approximately 132 000 hr. The strains epsilon for the first 2000 hr. of time t were described by an equation of the form epsicon equals epsilon to the zero power plus epsilon to the plus power times t the nth power. This equation was found to predict the creep of PVC for approximately 132,000 hr. with reasonable accuracy. The predicted strains for polyethylene were somewhat low. Strains during unloading and reloading after 90,000 hr. of creep were predicted reasonably well by the Boltzmann superposition principle. Author (GRA)

N74-26065# Army Poreign Science and Technology Center, Charlottesville, Va.
PREDICTING THE DURABILITY OF WELDED JOINTS OF THERMOPLASTIC FILMS
M. G. Dodin and S. B. Ratner 7 Nov. 1973 8 p Transl. into ENGLISH from Plasticheskie Massy (Moscow), no. 4, 1869 p 68-70
(AD-776557; FSTC-HT-23-1665-72) Avail: NTIS CSCL 11/9

The investigations were conducted on films of crystalline low density polyethylene (PE n.p.) and amorphous polyvinyl chloride (PVC). The durability of welded joints was determined on a special device, at a temperature of from 20-70C. The tests were conducted in a regime of constant stress on the test object, which was in the form of a belt with a width of 10 mm. The conditions of the experiment varied in such a way that the durability changed by 5-6 orders of magnitude. Equations were devised by which mechanical durability could be predicted. GRA

N74-26066# Watervliet Arsenal, N.Y.
TORSIONAL FATIGUE BEHAVIOR OF GRAPHITE-EPOXY CYLINDERS M.S. Thesis
Robert R. Fujczak Mar. 1974 52 p refs
(AD-776328; WVT-TR-74006) Avail: NTIS CSCL 11/4

The effects of fiber orientation on torsional fatigue life were studied for graphite-epoxy cylinders. The fiber orientations used were parallel to the longitudinal cylindrical axis and at angles of plus or minus 45 degrees to the axis. Torsional stresses for the plus or minus 45 degree tubes at equivalent numbers of failure cycles were almost 4 times as high as those for longitudinal tubes. A plot of shear strain vs. fatigue cycles indicated that shear strain is a more sensitive parameter to describe fatigue life than torsional stress in cylinders. Also, shear strain of cylinders at any given time during fatigue indicates the remaining life of the component independent of the fiber orientation. (Modified author abstract) GRA

N74-26067# Watervliet Arsenal, N.Y.
DEVELOPMENT OF HIGH STRENGTH FILAMENT REINFORCED SUPERALLOY COMPOSITES
I. Ahmad, W. J. Heffernan, J. M. Barranco, F. Saegusa, and R. Haskell Mar. 1974 75 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-776346; WVT-TR-74005) Avail: NTIS CSCL 11/4

The report describes the progress made during FY 73 on the subject project, the objective of which is to develop high strength filament (tungsten alloys and silicon carbide) reiforced superalloy composites with a rupture life of 100 hours under 30 ksi at 2000F. FY 73 work has resulted in the application of investment casting to the fabrication of cobalt base composites containing W-1%ThO2 and SiC filaments. Feasibility of the casting of a vane was also demonstrated. GRA

N74-26068# Monsanto Research Corp., St. Louis, Mo.
THE EFFECTS OF THICK INTERFACES ON THE MECHANICAL PERFORMANCE OF FIBER REINFORCED COMPOSITES
R. E. Lavengood, M. J. Michno, and J. D. Fairing Mar. 1974 56 p refs
(Contract N00014-67-C-0218; NR Proj. 356-484)
(AD-776592; HPC-72-158) Avail: NTIS CSCL 11/4

Techniques are described which permit the application of very uniform thin epoxy coatings on boron or 5 mil diameter glass fiber. These thick interfaces improve the transverse strength and interlaminar shear strength of glass/epoxy composites by as much as 60% and 35% improvements are typical for boron/epoxy composites. Flexural and torsional fatigue strengths of both materials are improved by 1 to 3 orders of magnitude. The resistance of composites to boiling water is also dramatically improved. After a 2 hour boil, thick interface samples retain more than 80% of their original transverse strength while control samples retain only 65 to 75%. Author (GRA)

N74-26069# Monsanto Research Corp., St. Louis, Mo.
MOLDING OF ORIENTED SHORT-FIBER COMPOSITES. 2: FLOW THROUGH CONVERGENT CHANNELS
Lloyd A. Goettler Mar. 1974 53 p refs
(Contract N00014-67-C-0218; NR Proj. 356-484)
(AD-776591; HPC-70-130) Avail: NTIS CSCL 11/4

Superior mechanical properties can be attained in a short fiber composite by using the flow in transfer or injection molding to align the fibers into the direction of highest stress. This is best accomplished in an elongational flow field, such as occurs in a converging channel. A model is derived to describe the changes in orientation distribution resulting from this flow. The author investigated the effects of the geometric, material, and processing variables on the orientation parameters of this model, the resulting orientation level and the tensile modulus of molded rods. Author (GRA)

N74-26070# Tel-Aviv Univ. (Israel). School of Engineering.
ON WAVE PROPAGATION IN MATERIALS REINFORCED WITH BI-DIRECTIONAL FIBERS. PART 2 Final Report, Jul. 1972 - Jul. 1973
Yechiel Weitsman and Yako Benveniste Jul. 1973 68 p refs
(Contract DAJA37-73-C-0400; DA Proj. 2O0-61102-B-33G)
(AD-776409) Avail: NTIS CSCL 11/4

The report presents the results of an investigation of the propagation of plane harmonic elastic waves in composite materials that are reinforced with straight bi-directional fibers. The fibers were assumed to be extensible as well as inextensible. Expressions are given for slowness surfaces, group velocities, energy fluxes, stresses and displacements. All these quantities are related to the material properties, fiber direction and the direction of propagation. Several reflection-refraction problems are solved and discussed. In those problems the authors considered two semi-infinite media bonded at a plane interface. Those media are identical in all respects except for fiber directions. It is shown that changes in fiber directions have a crucial influence on the forward progress of the wave energy. (Modified author abstract) GRA

N74-26071# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
RESEARCH FOR ENGINE DEMONSTRATION OF EROSION-RESISTANT COATING EFFECTIVENESS Final Report
Charles C. McComas and Larry S. Sokol Mar. 1974 64 p refs
(Contract DAAG46-73-C-0249; DA Proj. 1T0-62105-A-328)
(AD-776416; PWA-FR-6186; AMMRC-CTR-74-9) Avail: NTIS CSCL 11/3

The objectives of this program were to optimize the electroless nickel-plating procedure (PWATM 36) for titanium alloys (Ti-8Al-1Mo-1V and Ti-6Al-4V) to provide a more uniform underlayer for the TIKOTE-C erosion-resistant coating system. TIKOTE-C is a proprietary titanium carbonitride coating. The PWA 36 electroless-nickel promised to provide a more uniform and less expensive underlayer for the TIKOTE-C, with greater adhesion to titanium and less fatigue strength reduction than the multiple layer electroless nickel, electrolytic-nickel combination previously used. The approach to the program was first to optimize the PWA 36 electroless nickel process parameters on both the Ti alloys to achieve maximum adhesion and minimum loss of fatigue strength. Metallographic examination of the coating disclosed uniform nickel and TIKOTE-C layers with clean, void-free bond lines at the titanium-nickel and nickel-TIKOTE-C interfaces. Tensile adhesion values were greater than those obtained with other nickel underlayers. (Modified author abstract) GRA

N74-26072# RAND Corp., Santa Monica, Calif.
HIGH-PERFORMANCE COMPOSITE MATERIALS FOR VEHICLE CONSTRUCTION: A FINITE ELEMENT COMPUTER PROGRAM FOR THE ELASTOPLASTIC ANALYSIS OF CRACK PROPAGATION IN A UNIDIRECTIONAL COMPOSITE
Tiina Repnau and Donald F. Adams Oct. 1973 159 p refs
(Contract F44620-73-C-0011)
(AD-776822; R-1392-PR) Avail: NTIS CSCL 11/4

Structural materials composed of stiff filaments embedded in a plastic matrix--e.g., a boron-aluminum composite--have very high compressive strength per unit weight, but their performance is limited by a resistance to transverse loading that is no greater than that found in conventional materials. A step toward predicting the strength of composite materials is the numerical model and computer program of crack initiation and propagation under transverse normal loading, documented here. Based on the tangent modulus, finite element method of elastoplastic analysis, the FORTRAN IV program models material failure of the type that has been observed in composite materials, where microscopic cracks develop at the matrix-filament boundary and propagate throughout the matrix. (Modified author abstract) GRA

N74-26073# Naval Air Propulsion Test Center, Trenton, N.J.
EVALUATION OF MIL-L-23699 LUBRICATION OIL PERFORMANCE IN THE J79 ENGINE Final Report
Frank Feinberg Mar. 1974 18 p refs
(AD-776535; NAPTC-PE-39) Avail: NTIS CSCL 11/8

An evaluation was made of the service performance characteristics of MIL-L-23699B oils in the J79 engine. Operational experience and problems, lubricant condition, and the condition of lubricant wetted engine components at overhaul are discussed. Recommendations are made concerning the expected life of MIL-L-23699 oils in this engine. Author (GRA)

N74-26074# Case Western Reserve Univ., Cleveland, Ohio.
MORPHOLOGY OF AMORPHOUS POLYMERS Final Report
Phillip H. Geil Nov. 1973 51 p refs
(Contract DAHC04-70-C-0032)
(AD-776983; TR-260) Avail: NTIS CSCL 11/9

Recent morphological research has indicated that a number of amorphous polymers consist of small, liquid-crystal-like domains. Annealing below Tg can cause a change in size of the ca. 100A diameter domains and their internal order. These results and related evidence for local order in polymer melts and solutions are reviewed, followed by consideration of the effect of the domain structure on the physical properties of a specific polymer, polycarbonate, and the relationship of this structure to the concept of free volume. Author (GRA)

N74-26075# Effects Technology, Inc., Santa Barbara, Calif.
STRESS WAVE RESPONSE OF CARBON COMPOSITE

MATERIALS Final Report, 12 May 1972 - 11 Sep. 1973
Floyd R. Tuler, Marlyn E. Graham, and Mark A. Ferdman Jan. 1974 227 p refs
(Contract DAAG46-72-C-0135; DA Proj. 1W1-62113-A-661)
(AD-776979; AMMRC-CTR-74-2) Avail: NTIS CSCL 11/4

The stress wave response and damage was examined in two dimensionally (2D) reinforced carbon phenolic and carbon carbon composite materials and a three dimensionally (3D) reinforced carbon carbon composite material. The 2D carbon phenolic composite material was fabricated to represent the matrix of 3D composites investigated in a previous program, and the 2D carbon carbon was fabricated to represent the matrix of the 3D carbon carbon. Average stress wave attenuation was determined using front surface and in-material carbon composition piezoresistive gages. In addition, high magnification streak photography was used to measure the micro-mechanical response of the fiber bundle and interfiber matrix regions of the 3D carbon carbon. For each material, the stress wave damage modes and levels were characterized visually and microscopically and property degradation was determined in dynamic three-point bending. (Modified author abstract) GRA

N74-26076# IIT Research Inst., Chicago, Ill.
FABRICATION OF HARD GLASS PLATES Final Report
M. Akbar Ali and A. Zeev Hed Jan. 1974 24 p refs
(Contract DAAG46-73-C-0150; DA Proj. 1T1-62105-A-330)
(AD-776964; AMMRC-CTR-74-13) Avail: NTIS CSCL 11/2

This report describes the fabrication of hard glass for use in ballistic application. The work consisted of establishing optimum composition and process conditions for several different glasses. Properties such as Knoop hardness, density, flexural strength, Young's modulus, visible transmission and percent haze were determined. A beryllia containing glass having an apparent hardness of approximately 900 Knoop (density = 2.56 gram/cc) was selected for ballistic testing and thirty-two 4-inch diameter discs were fabricated for this purpose. Author (GRA)

N74-26077# Texas A&M Univ., College Station.
A COMPARISON OF CURRENT WORK-HARDENING MODELS USED IN THE ANALYSIS OF PLASTIC DEFORMATIONS
Barry Hunsaker, Jr., David K. Vaughan, and James A. Stricklin Oct. 1973 79 p refs
(Contract N00014-68-A-0308-0004)
(AD-776667; TEES-RPT-2926-73-3) Avail: NTIS CSCL 11/6

The report presents an evaluation of four hardening rules of the incremental theory of plasticity to determine which of the rules are better suited for use in finite element or finite difference structural analysis computer programs. The hardening rules considered are isotropic hardening, the Prager-Ziegler kinematic hardening rule, the Mroz model, and the mechanical sublayer model. Comparisons of experimental data with hardening rule predictions (from a total incremental plasticity formulation using the von Mises yield condition and associated flow rule) for simple loading paths are first considered. Next the computer storage requirements associated with each hardening rule are investigated. Finally, the two most promising hardening rules are incorporated into an existing dynamic, shell of revolution finite element computer code and the cases of an impulsively loaded circular ring and circular plate are examined. Conclusions regarding the areas of applicability of each hardening rule are then presented. Author (GRA)

N74-26078# Army Natick Labs., Mass. Clothing and Personal Life Support Equipment Lab.
THE RESPONSE OF AIRCRAFT CAMOUFLAGE LACQUERS TO THERMAL RADIATION. PART 2; 6000 DEGREES K RADIATOR AND 800 FT/SEC AIR FLOW
Earl T. Waldron Nov. 1973 22 p refs
(AD-776884; C/PLSEL-116-Pt-2;
USA-NLABS-TR-74-12-CE-Pt-2) Avail: NTIS CSCL 11/3

Three colors of each of two lacquers on aluminum panels were exposed to radiation simulating that from 100 KT and 1 MT weapons, while air at a velocity of 800 ft/sec flowed across the exposed surface of the panels. Differences in the response of the lacquer-color combinations were observed, temperatures at the rear surface of the panels were measured, and an expression relating response to weapon size was derived. Author (GRA)

N74-26079# TRW Systems Group, Redondo Beach, Calif.
HOLOGRAPHIC CHARACTERIZATION OF CERAMICS: PART 4: MEASUREMENT OF SURFACE ROUGHNESS ON Si3N4 BEARING SURFACES Final Report
T. V. Roszhart 1973 70 p
(Contract N00019-73-C-0298)
(AD-776454) Avail: NTIS CSCL 11/2

A method for measuring the surface roughness of ceramic bearings was developed using coherent light techniques. The method is noncontacting and nondestructive and is applicable to cylindrical (and spherical) surface geometries. Surface roughnesses varying from 193 microinches to 9.46 microinches (A.A.) were measured in the longitudinal and circumferential directions on typical Si3N4 bearing specimens. This technique, referred to as Coherent Surface Analysis, determines surface roughness by analyzing the scattering of a laser beam from random surfaces. Since the laser beam can be scanned over the entire surface, it is possible to measure point to point variations in roughness. This feature was used to measure the change in surface roughness caused by rolling contact fatigue. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-26080 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON THE VALUE DISTRIBUTION OF INTEGRAL FUNCTIONS
Sakari Toppila (Helsinki Univ.) 1974 21 p refs
(ISBN-951-41-0170-7) Copyright. Avail: Issuing Activity

A plane set E is said to be a Picard set for entire functions if every transcendental entire function takes all finite values, with at most one exception, infinitely often in the complement of E. On this basis, the following problem is considered: under what conditions would the union of a countable set of discs be a Picard set for entire functions. D.L.G.

N74-26081 Suomalainen Tiedeakatemia, Helsinki (Finland).
SOME REMARKS ON LINEAR PICARD SETS
Sakari Toppila 1973 18 p refs
(ISBN-951-41-0156-1; Rept-569) Copyright. Avail: Issuing Activity

It is stated that a closed set E in a plane is a Picard set if every non-rational function f, meromorphic outside E, takes every complex value with at most two exceptions infinitely often in the complement of E. Various sufficient conditions for E to be a Picard set for entire functions are presented along with proofs of the supporting theorems. D.L.G.

N74-26082*# Michigan State Univ., East Lansing. Dept. of Mathematics.
ON SOME PROBLEMS IN A THEORY OF THERMALLY AND MECHANICALLY INTERACTING CONTINUOUS MEDIA Ph.D. Thesis
Yong Mok Lee 1971 134 p refs
(Grant NGR-23-004-041)
(NASA-CR-138496) Avail: NTIS HC $9.75 CSCL 12A

Using a linearized theory of thermally and mechanically interacting mixture of linear elastic solid and viscous fluid, we derive a fundamental relation in an integral form called a reciprocity relation. This reciprocity relation relates the solution of one initial-boundary value problem with a given set of initial and boundary data to the solution of a second initial-boundary value problem corresponding to a different initial and boundary data for a given interacting mixture. From this general integral relation, reciprocity relations are derived for a heat-conducting linear elastic solid, and for a heat-conducting viscous fluid. An initial-boundary value problem is posed and solved for the mixture of linear elastic solid and viscous fluid. With the aid of the Laplace transform and the contour integration, a real integral representation for the displacement of the solid constituent is obtained as one of the principal results of the analysis. Author

N74-26083*# Prairie View Agricultural and Mechanical Coll., Tex.
RELIABILITY ANALYSIS OF REDUNDANT SYSTEMS
H. Y. Yeh Jan. 1974 26 p refs
(Grant NGR-44-033-022)
(NASA-CR-138487) Avail: NTIS HC $4.50 CSCL 12A

A method is proposed to compute the transition probability (the probability of partial or total failure) of parallel redundant system. The effect of geometry of the system, the direction of load, and the degree of redundancy on the probability of complete survival of parachute-like system are also studied. The results show that the probability of complete survival of three-member parachute-like system is very sensitive to the variation of horizontal angle of the load. However, it becomes very insignificant as the degree of redundancy increases. Author

N74-26084*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RM2: TRANSFORM OPERATIONS
Robert F. Rice 1 Mar. 1974 27 p refs
(Contract NAS7-100)
(NASA-CR-138463; JPL-TM-33-680) Avail: NTIS HC $4.50 CSCL 12A

The two-dimensional transform used in the research TV source encoder, RM2 is discussed. It is shown that both conceptually and in terms of the number of required computations, the RM2 transform is considerably simpler than the Fast Hadamard Transform. The latter can in fact be generated by extending the RM2 transform. Author

N74-26085*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STAR ADAPTATION FOR TWO-ALGORITHMS USED ON SERIAL COMPUTERS
Lona M. Howser and Jules J. Lambiotte, Jr. Washington Jun. 1974 29 p refs
(NASA-TM-X-3003; L-9380) Avail: NTIS HC $3.25 CSCL 12A

Two representative algorithms used on a serial computer and presently executed on the Control Data Corporation 6000 computer were adapted to execute efficiently on the Control Data STAR-100 computer. Gaussian elimination for the solution of simultaneous linear equations and the Gauss-Legendre quadrature formula for the approximation of an integral are the two algorithms discussed. A description is given of how the programs were adapted for STAR and why these adaptations were necessary to obtain an efficient STAR program. Some points to consider when adapting an algorithm for STAR are discussed. Program listings of the 6000 version coded in 6000 FORTRAN, the adapted STAR version coded in 6000 FORTRAN, and the STAR version coded in STAR FORTRAN are presented in the appendices. Author

N74-26086# Maryland Univ., College Park. Dept. of Physics and Astronomy.
ORTHOGONALITY RELATION FOR COVARIANT HARMONIC OSCILLATOR WAVE FUNCTIONS
Michael J. Ruiz May 1974 8 p refs
(TR-74-096) Avail: NTIS HC $4.00

Orthogonality relations for the Kim-Noz covariant harmonic oscillator wave functions are discussed. It is shown that the wave functions belonging to different Lorentz frames satisfy an orthogonality relation. Author

N74-26087# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE APPLICATION OF PROBABILISTIC AND ASYMPTOTIC METHODS IN THE THEORY OF THE OSCILLATIONS OF STOCHASTIC SYSTEMS
Yu. A. Mitropolskii and V. G. Kolomiets Feb. 1973 13 p refs Transl. into ENGLISH from Mat. Fiz., Respublikanskii Mezhvedomstvennyi Sb. (USSR), 1971 p 89-95
(NTC-74-50411; Rept-73-60) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The study of the conduct of slightly nonlinear automatic and non-automatic oscillatory systems which are operating under the influence of small random forces was conducted. The influence of such processes on an oscillatory system leads to a process without aftereffects. It was found that the application of approximation methods, those based on the application of nonlinear mechanics and Markov processes, is the most efficient way of investigating such systems. Mathematical models are developed to show the relationships of the parameters. Author

N74-26088# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOME INVESTIGATIONS ON A FAST METHOD OF GENERATING DIGITAL RANDOM NUMBERS
Y. Moriyama and S. Kitamura Mar. 1973 15 p refs Transl. into ENGLISH from Inform Process. in Japan (Japan), v. 14, no. 1, 1973 p 15-22
(NTC-74-11874; Rept-73-79) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A fast method of generating digital random numbers using arithmetic operations of an L bit exclusive-or and a cyclic rotation was developed. Some properties of the pseudorandom numbers are presented as follows: (1) An equation of the ith random number is derived by means of the delay operator method. (2) There are special relations between the shorter periods and the initial values. (3) There are some sub-periods in the word lengths of 5, 11, 13 and 19 that have unreasonable randomness. Author

N74-26089*# Houston Univ., Tex. Dept. of Mathematics.
COMMUTATIVE SEMIGROUPS OF REAL AND COMPLEX MATRICES
D. R. Brown Apr. 1974 8 p refs
(Contract NAS9-12777)
(NASA-CR-134296; Rept-25) Avail: NTIS HC $4.00 CSCL 12A

The computation of divergence is studied. Covariance matrices to be analyzed admit a common diagonalization, or even triangulation. Sufficient conditions are given for such phenomena to take place, the arguments cover both real and complex matrices, and are not restricted to Hermotian or other special forms. Specifically, it is shown to be sufficient that the matrices in question commute in order to admit a common triangulation. Several results hold in the case that the matrices in question form a closed and bounded set, rather than only in the finite case. Author

N74-26090# Gesellschaft fuer Mathematik und Datenverabeitung, Bonn (West Germany). Inst. fuer Mathematik.
ON THE THEORY OF ELASTIC VIBRATIONS [ZUR THEORIE ELASTISCHER SCHWINGUNGEN]
Rolf Leis 1973 56 p refs In GERMAN Sponsored by Bundesmin. fuer Forsch. und Technol. and Landesamt fuer Forsch des Landes Nordrhein-Westfalen
(BMFT-GMD-72) Avail: NTIS HC $6.00

A theory of boundary value and eigenvalue problems was developed for time-independent elasticity equations. Special weight was given to the treatment of external space problems. Isotropic and special anisotropic media were considered. ESRO

N74-26091# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
ON THE THEORY OF GREEN'S DYADICS OF POLYNOMIAL OPERATORS
Ismo V. Lindell 27 Nov. 1973 18 p refs Sponsored by Fulbright Grant to Ill. Univ., Urbana
(Rept-S-58; ISBN-951-750-135-8) Avail: NTIS HC $4.00

Dyadic formalism is applied to a dyadic Green's problem where the dyadic operator is a polynomial of the vector operator. The method of reducing the dyadic equation to a scalar equation is discussed and a table of various operators important in electromagnetics together with reduced operators is presented. Applying affine space transformations, free-space solutions for these operators are considered with applications in electromagnetics of various media. Author (ESRO)

N74-26092# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.
THEORY AND PROPERTIES OF DISCRETE WALSH FUNCTIONS [THEORIE UND E IGENSCHAFTEN DISKRETER WALSHFUNKTIONEN]
Hermann Kremer Jul. 1972 32 p refs In GERMAN

(IND-FB-31) Avail: NTIS HC $4.75

Discrete Walsh functions in Kronecker ordering are defined. Instructions for mapping these functions on binary and sequentially ordered discrete Walsh functions were derived. The most important mathematical properties of the three ordering systems are indicated. ESRO

N74-26093# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

COMPILATION OF SOME METHODS FOR THE DESCRIPTION OF TIME DISCRETE AND CONTINUOUS SYSTEMS (DIGITAL FILTER 1) [ZUSAMMENSTELLUNG EINIGER METHODEN ZUR BESCHREIBUNG ZEIT-DISKRETER UND -KONTINUIERLICHER SYSTEME (DIGITALFILTER 1)]

Arild Lacroix Feb. 1972 16 p refs In GERMAN

(IND-FB-37) Avail: NTIS HC $4.00

Time discrete and continuous systems are described by difference and differential equations. Some methods for the solution of these equations are compiled, aiming at a methodically good introduction to the theory and applications of difference equations. Discrete systems, such as digital filters, are described by difference equations, so that a comparison of methods for the solution of difference and differential equations is possible. ESRO

N74-26094# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

ORTHOGONALITY OF REAL FOURIER MATRIX FORMED BY SAMPLED VALUES OF SIN AND COS FUNCTIONS [DIE ORTHOGONALITAET DER AUS DEN ABTASTWERTEN VON SIN- UND COS-FUNKTIONEN GEBILDETEN REELLEN FOURIERMATRIX]

Karl Heinz Georgi Mar. 1972 11 p In GERMAN

(IND-FB-39) Avail: NTIS HC $4.00

If vectors are formed out of N-2M sampled values of N sequential sin and cos functions, and the time increment raster is fixed 2 pi/N, then the vectors are orthogonal, and the derived quadratic matrix is generally regular. It is shown that the vectors formed from equidistant sampling values remain orthogonal even for a random phase shift. ESRO

N74-26095# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

COMPARISON OF TIME DISCRETE AND CONTINUOUS SYSTEMS. PART 3: STATE REPRESENTATION AND CANONICAL STRUCTURES [GEGENUEBERSTELLUNG ZEIT-DISKRETER UND-KONTINUIERLICHER SYSTEME. TEIL 3: ZUSTANDSDARSTELLUNG UND KANONISCHE STRUKTUREN]

Arild Lacroix May 1972 25 p refs In GERMAN

(IND-FB-40) Avail: NTIS HC $4.25

The state representation of linear time-invariant systems of concentrated elements is derived from the linear differential equation with constant coefficients. The interpretation of the equations of state leads to canonical structures and the solution for equations of state is indicated. ESRO

N74-26096# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

COMPARISON OF THE QUANTIZED FOURIER TRANSFORMATION WITH A RECURSIVE METHOD FOR THE CALCULATION OF THE STEADY STATE OF LINEAR SYSTEMS [VERGLEICH DER QUANTISIERTEN FOURIER-TRANSFORMATION MIT EINEM REKURSIVEN VERFAHREN ZUR BERECHNUNG DES EINGESCHWUNGENEN ZUSTANDS LINEARER SYSTEME]

Hermann Kremer Sep. 1972 19 p refs In GERMAN

(IND-FB-43) Avail: NTIS HC $4.00

Klein's method for calculating the steady state of linear system for periodic excitation by means of a quantized Fourier transformation is compared with Kremer's recursive method. It is shown that after the introduction of certain approximations, the methods are compatible. ESRO

N74-26097# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

ON MATRIX REPRESENTATION OF PERIODIC AND APERIODIC DYADIC CONVOLUTIONS

M. N. Gulamhusein (Cambridge Univ., Engl.) Apr. 1973 18 p refs

(IND-FB-53) Avail: NTIS HC $4.00

A simple matrix theory proof of the periodic dyadic convolution theorem is given, and this is used to compute both the periodic and aperiodic dyadic convolution in the Walsh transform domain. A method of sectioning is described for the fast computation of the periodic and aperiodic dyadic convolution of a large input sequence and a finite duration impulse response. This is based on the partitioning of the convolution matrices and leads to a block diagonal structure for the convolution matrices. ESRO

N74-26098# Technische Hochschule, Darmstadt (West Germany). Fachbereich Nachrichtentechnik.

EIGENVALUES AND EIGENVECTORS OF COMPLEX FOURIER MATRICES [EIGENWERTE UND EIGENVEKTOREN KOMPLEXER FOURIER-MATRIZEN]

Hermann Kremer Jun. 1973 16 p refs In GERMAN

(IND-FB-57) Avail: NTIS HC $4.00

A generalized representation of the eigenvalues and eigenvectors of arbitrarily complex Fourier matrices is discussed. The proofs of the derived relationships only necessitate elementary formulas from matrix theory, and are essentially simpler than the proofs known from literature. ESRO

N74-26099# Army Foreign Science and Technology Center, Charlottesville, Va.

INTERPOLATIONAL TRANSFORMS WITH CONSTANT COEFFICIENTS: IMPROVEMENT OF CONVERGENCE IN SEQUENCES

V. I. Krilov and L. G. Kruglikova 31 Jan. 1974 7 p refs Transl. into ENGLISH from unidentified RUSSIAN article

(AD-776177; FSTC-HT-23-296-72) Avail: NTIS CSCL 12/1

Equations are given for interpolational transforms with constant coefficients. Improvement of convergence in sequences is shown. The following lemma was proven: The roots of the characteristic equation are real, different and lay inside the intercept. GRA

N74-26100# Wisconsin Univ., Madison. Mathematics Research Center.

SIMULTANEOUS SYSTEMS OF DUAL INTEGRAL EQUATIONS AND SOME MIXED BOUNDARY VALUE PROBLEMS OF ELASTICITY

R. P. Srivastav Jan. 1974 45 p refs

(Contract DA-31-124-ARO(D)-462)

(AD-775592; MRC-TSR-1407) Avail: NTIS CSCL 12/1

A method for solving simultaneous systems of dual integral equations is developed. The equations considered here have trigonometric and Bessel function kernels. These equations arise in the problems of adhesive contact and in certain crack problems of composite media. The solutions are sought in the form of Neumann series which lead to coupled singular integral equations solvable in a closed form. Certain physical quantities of interest are calculated. Author (GRA)

N74-26101# IBM Watson Research Center, Yorktowh Heights, N.Y.

ON BALANCED MATRICES

A. J. Hoffman, D. R. Fulkerson (Cornell Univ.), and Rosa Oppenheim (Rutgers Univ.) 14 Feb. 1974 21 p refs

(Contract DAHC04-72-C-0023; N00014-67-A-0077-0002; Grant NSF GP-32316X)

(AD-776237; RC-4724) Avail: NTIS CSCL 12/2

It is proven that if A, a (0,1) matrix is balanced, then the answers are affirmative for all nonnegative integral vectors. Results are used to relate the theory of balanced matrices to those of blocking pairs of matrices and antiblocking pairs of matrices. Pertinent aspects of these two geometric duality theories are summarized. S.K.W.

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-26102+ Swiss Inst. of Meteorology, Zurich.
SWISS METEOROLOGICAL BIBLIOGRAPHY
Apr. 1974 34 p refs In FRENCH
(Rept-73-11) Avail: NTIS HC $4.75

A bibliography containing 83 meteorological references is presented. Data cover microclimatology, biometeorology, and agricultural meteorology as well as synoptic meteorological references. Data are also included on the instruments used to make the observations. Transl. by E.H.W.

N74-26103# National Environmental Satellite Service, Washington, D.C. Satellite Field Services Station.
WHAT ARE YOU LOOKING AT WHEN YOU SAY THIS AREA IS A SUSPECT AREA FOR SEVERE WEATHER?
Arthur H. Smith, Jr. Feb. 1974 18 p
(NOAA-TM-NESS-56) Avail: NTIS HC $4.00

The activities are summarized of the Satellite Field Services Station (SFSS) at Washington, D.C., in connection with the tornado watch of Sunday, May 20, 1973. The procedures used by the SFSS meteorologist in analyzing satellite photographs and issuing satellite narratives relating to the area of suspected severe weather activity are described in detail. The actual Applied Technology Satellite 3 pictures used, the SFSS activity log, and the Satellite narrative messages issued are presented as an illustration of SFSS procedures during a potential or actual severe weather situation. Author

N74-26104# Advisory Group for Aerospace Research and Development, Paris (France).
THE FLUID DYNAMICS ASPECTS OF AIR POLLUTION RELATED TO AIRCRAFT OPERATIONS
P. A. Libby, ed. (California Univ., San Diego) Feb. 1974 53 p refs
(AGARD-AR-55) Avail: NTIS HC $5.75

The proceedings of the round table discussion are presented and include: (1) aircraft dispersion of pollutants, (2) air pollution characteristics of aircraft engines, (3) research in Germany on air pollution related to aircraft operations, (4) large scale mass transport, and (5) air pollution from aircraft. For individual titles, see N74-26105 through N74-26109.

N74-26105* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
THE DISPERSION OF PROPELLANTS FROM AIRCRAFT c28
James A. Fay and John B. Heywood *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 5-16 refs (For availability see N74-26104 15-20)
(Grant NGR-22-009-378)
CSCL 21B

Two aspects of the dispersion of pollutants from aircraft are reviewed. The first is the dispersal of aircraft exhaust emissions in the vicinity of airports; the second is the dispersal of exhaust trails in the upper atmosphere. Techniques available for modeling this dispersal and how they might be applied to the airport problem are discussed. Field studies of airport pollution are then reviewed to assess current pollutant levels around airports and the aircraft's contribution to those levels. The possibility of contrail formation from jet emissions at high altitude is then considered and the effect of uncertainties in the trial mixing processes evaluated. Author

N74-26106 California Univ., Berkeley. Dept. of Mechanical Engineering.
AIR POLLUTION CHARACTERISTICS OF AIRCRAFT ENGINES c28
Robert F. Sawyer *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 17-26 (For availability see N74-26104 15-20)

Some results are presented of a survey on aircraft air pollution. The findings indicate that: (1) Aircraft are significant contributors to air pollution. (2) The engine is the primary source of aircraft air pollution. (3) Carbon monoxide and hydrocarbon emissions at low power and nitric oxide emissions at high power are the most important immediate engine pollution problems. D.L.G.

N74-26107 Technischen Universitaet, Munich (West Germany).
RESEARCH IN GERMANY ON FLUID-DYNAMICS OF AIR POLLUTION RELATED TO AIRCRAFT OPERATIONS c02
Franz Hindelang, J. *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 27-30 (For availability see N74-26104 15-20)

An overview is presented, based on a literature survey and a questionnaire, of German research on air pollution related to aircraft operation. The literature survey revealed that while there exists an abundance of material on air pollution in general, none was found to relate to aircraft operation. The questionnaire was sent to meteorologists, aerodynamicists, and aircraft companies. The answers obtained indicate a tremendous interest in the subject area with some research being conducted but not yet at the conclusive reporting stage. D.L.G.

N74-26108 Norwegian Inst. for Air Research, Kjeller.
PRELIMINARY NOTES ON LARGE SCALE MASS TRANSPORT c02
J. Nordo *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 33-40 (For availability see N74-26104 15-20)

The following areas of interest are discussed: (1) mesoscale transport of pollutants, (2) use of precipitation and flow patterns in Europe as a guide in designing a network of stations to measure air pollution, (3) acid precipitation in South Norway due to long range transport of sulfur from the industrial centers of Western Europe, (4) meteorological data analysis required for air pollution monitoring network, and (5) studies of air pollution in Europe during varying weather conditions. D.L.G.

N74-26109 Department of Trade and Industry, London (England). Civil Aviation.
AIR POLLUTION FROM AIRCRAFT c02
R. A. Mangiarotty *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 41-54 refs (For availability see N74-26104 15-20)
Avail: NTIS

The current work being conducted in the UK in three specific areas of atmospheric pollution related to aircraft operations is summarized. The three areas are: (1) jet engine pollution in the neighborhood of airports including its generation, its reduction by proper combustion design, and its dispersal by winds; (2) smoke trails. (3) Pollution at high altitudes due to jet engine discharge, with its special problems of chemistry and dispersion. Author

N74-26110# Environmental Data Service, Washington, D.C.
CATALOG OF METEOROLOGICAL SATELLITE DATA: ESSA 9 TELEVISION CLOUD PHOTOGRAPHY, 1 JULY - 30 SEPTEMBER 1971
1973 208 p refs
Avail: NTIS HC $13.50

The television cloud photography obtained by meteorological satellites is described. Photographic data acquired by ESSA 9 during the period of July 1, 1971 through September 30, 1971 are included. In this issue, digitized cloud maps replace the manually constructed nephanlyses which had been used in the earlier catalogs. Two polar stereographic maps are used to show the daily distribution of clouds over the earth, one for the Northern Hemisphere and one for the Southern Hemisphere. These maps are arranged according to pass day. Author

N74-26111*# Kanner (Leo) Associates, Redwood City, Calif.
SYSTEM OF INDICATIONS OF METEOROLOGICAL RESEARCH EFFICIENCY
N. Z. Pinus, B. I. Sakhnev, and V. I. Chernysh Washington NASA Jun. 1974 25 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 4, Apr. 1974 p 86-96
(Contract NASw-2481)
(NASA-TT-F-15693) Avail: NTIS HC $4.25 CSCL 04B

A number of factors, including indices of the value (scientific, applied, methodological), level of introduction (publication, materials and equipment, creative problem solving), and level of importance are considered to be major factors in evaluating efficiency of scientific research. An analytical parametric system for quantitative evaluation of efficiency of scientific research is presented. A series of criteria for assigning a numerical rating to each parameter and a set of weighting factors for each parameter are presented. The system is said to be applicable to all stages of research and development, from the stage of forecasting expected results of the work through final application of the development. Author

N74-26112# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION, SMOKE, AND SULFUR DIOXIDE Monthly Bulletin, Dec. 1972 [POLLUTION ATMOSPHERIQUE, FUMEE ET ANHYDRIDE SULFUREUX]
Dec. 1972 29 p In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $4.50

Data obtained at Belgian weather stations are tabulated. The air pollution apparatus is briefly described. ESRO

N74-26113# GEOMET, Inc., Rockville, Md.
PRESENT CAPABILITIES TO MODIFY WARM FOG AND STRATUS
Demetrios J. Moschandreas 18 Jan. 1974 109 p refs
(Contract N00014-71-C-0271; NR Proj. 082-275)
(AD-776261; GEOMET-EF-300) Avail: NTIS CSCL 04/2

Numerical model simulations, chamber tests, and field experiments are the three scientific approaches used to investigate the modification of warm fog and stratus. This study is an in-depth review of the literature on warm fog dissipation; both theoretical and experimental projects are reviewed and critical comments are made on the reported claims. Most all the projects on warm fog modification are summarized in various tables while a few are analyzed in a more detailed fashion. Special emphasis is put on the sponsoring agencies; the goals, objectives, and the amounts allocated by the various research sponsoring organizations are also reviewed. The need for greater statistical analysis in evaluating the results of field experiments is noted. Among the numerous techniques used to improve visibility, two are proposed as the most promising: the thermal dissipation of warm fog and stratus, and the combination of the seeding and helicopter techniques. (Modified author abstract) GRA

N74-26114# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTS SUPPORTING A PROGRAM OF WARM FOG DISPERSAL BY ELECTRICAL CHARGE INJECTION Final Report, Jan. 1973 - Jan. 1974
G. E. Schacher and W. Reese 28 Jan. 1974 44 p
(AD-775911; NPS-61SQ/RC74011) Avail: NTIS CSCL 04/2

The report summarizes the results of a number of experiments conducted to support a program of fog clearing by the injection of electrical charges into the fog. Experiments were made to determine the charge transferred to water sprays which showed that contact charging mechanisms were as much as one million times as effective as induction charging mechanisms. The charge on soap film bubbles was measured and it was found that for a 2 inch bubble formed at 30 kV the charge was on the order of 1 micro Coulomb. Tests of fog clearing in an environmental chamber indicated fair results with water spray techniques and much better results with techniques by which charge is injected directly into the atmosphere (corona injection). Preliminary tests of corona injection into the atmosphere were carried out and showed that considerable charge attached to windborne particles. Author (GRA)

N74-26115# Atmospherics, Inc., Fresno, Calif.
ICE CRYSTAL INHIBITION (ICI PROJECT). AN APPLICATIONS PROGRAM OF CHEMICAL DISPERSAL IN SMALL CUMULUS CLOUDS
Thomas J. Henderson and Donald W. Duckering 15 Jun. 1973 40 p
(Contract N00123-72-C-1723)
(AD-775630) Avail: NTIS CSCL 04/2

The application of chemicals to small cumulus clouds was accomplished with a turbocharged Piper Navajo aircraft. This aricraft has an altitude capability of 30,000 ft msl and is equipped for general cloud seeding programs throughout the United States. This equipment included special holding racks for a variety of pyrotechnic devices and wing-tip mounted liquid fuel generators primarily designed for burning a mixture of AgI-NH4I in acetone. These wing-tip generators were used to disperse the unburned chemical material during the field experiments. Attempts were made to choose small cumulus clouds (tops less than 20,000 ft msl) which were maintaining a reasonably long life span through a series of pusling turret developments. Additionally, attempts were made to choose clouds which were showing significant glaciation toward the end of each pulsing cycle. The applications plan was simply to disperse chemical material in the strong inflow region at cloud base when an individual turret was in the vertical development stage, yet had not reached the point of significant glaciation. Observations from the aircraft were to follow with emphasis on the visual detection of ice crystal formation in both time and space. The report summarizes the aerial applications experiment and presents some tentative conclusions drawn from the overall observations. GRA

N74-26116# Arizona Univ., Tucson. Lab. of Tree-Ring Research.
RECONSTRUCTION OF PAST CLIMATIC VARIABILITY Semiannual Technical Report, 30 Jun. - 31 Dec. 1973
Harold C. Fritts, M. A. Stokes, J. S. Dean, M. A. Wiseman, and C. W. Stockton 30 Dec. 1973 25 p
(Contract AF-AFOSR-2406-72)
(AD-775999; AFOSR-74-0252TR; SATR-3) Avail: NTIS CSCL 04/2

In the first half of Year Two in the project Reconstruction of Past Climatic Variabiliby, the following have been the major accomplishments: (1) Processing of tree-ring data already collected, bringing the total number of chronologies available for climatic reconstruction to 56; (2) Collecting in eastern United States and in Alaska, including a major trip into the Mississippi drainage region which added 23 new sample sites and updated the older University of Chicago collection; (3) Compiling climatic data which will be used to calibrate tree-ring data. Author (GRA)

N74-26117# Army Electronics Command, Fort Monmouth, N.J.
AN ITERATIVE INVERSION OF THE RADIATIVE TRANSFER EQUATION FOR TEMPERATURE PROFILES
Louis D. Duncan Mar. 1974 24 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-776899; ECOM-5534) Avail: NTIS CSCL 04/2

An iterative technique is developed for determining atmospheric temperature profiles from measurements of the earth's outgoing radiance. The solution is nonlinear, thus allowing for meaningful physical and mathematical results and avoiding computational difficulties which often arise from linear approaches. An algorithm has been developed to increase the rate of convergence. When this algorithm is used, convergence is usually obtained in three iterations. Author (GRA)

N74-26118# Chicago Univ., Ill. Lab. for Atmospheric Probing.
ON THE ORIGIN AND STRUCTURE OF RADAR ECHO LAYERS IN THE CLEAR ATMOSPHERE Ph.D. Thesis
James I. Metcalf 1 Jan. 1974 164 p refs
(Contract N00014-67-A-0285-0014; Grant DA-ARO(D)-31-124-71-G71)
(AD-776577; TR-34) Avail: NTIS CSCL 04/2

A field project was conducted at San Diego, California, to investigate the structure of waves and radar echoes in the low-level marine inversion. A variety of data are presented to illustrate the dynamical processes at work in the surface layer and in the inversion above. Implications of these results for further studies of atmospheric waves and turbulence are discussed. (Modified author abstract) GRA

N74-26119# Stanford Research Inst., Menlo Park, Calif.
CONDENSATION NUCLEI AND AERSOL POPULATIONS RELATED TO FOG FORMATION Final Report, 1 Jun. 1967 - 31 Dec. 1973
Francis L. Ludwig, Samuel Schecter, Robert C. Robbins, and James Hart Smith Jan. 1974 213 p refs
(Contract DAHC04-67-C-0059; SRI Proj. PSU-6676)
(AD-776404; AROD-7257-9-EN; FR-2) Avail: NTIS CSCL 04/2

The nature of stratus and fog droplets and associated aerosols was studied in the field, in the laboratory, and through numerical modeling of condensation processes. GRA

N74-26120# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.

GLOBAL WEATHER MODELING WITH VECTOR SPHERICAL HARMONICS
Sven Bjorklund 10 Nov. 1973 118 p refs
(Contract DAHC04-72-C-0020; ARPA Order 2089)
(AD-776398; AROD-10814-2-A) Avail: NTIS CSCL 04/2

The report presents the current status of the work under ARPA order number 2089, dealing with weather modeling with a view toward climatological applications. Emphasis is on the solution of the primitive equations governing weather by means of vector spherical harmonics. GRA

N74-26121# Naval Postgraduate School, Monterey, Calif.
ESTIMATING BOUNDARY LAYER FLUXES FROM SHIPBOARD MEASUREMENTS OF DISSIPATIONS OF TURBULENT KINETIC ENERGY AND TEMPERATURE VARIANCE M.S. Thesis
William Edward Johnston Mar. 1974 131 p refs
(AD-776302) Avail: NTIS CSCL 04/2

Velocity and temperature fluctuation measurements were made over the open ocean from instruments mounted on the R/V ACANIA. These data were examined to determine the validity of present formulations and prediction techniques. Values of momentum flux, were inferred from the rate of dissipation of turbulent kinetic energy, epsilon. Dissipation values were obtained from spectral estimates and inner scale estimates. The momentum flux, computed from spectra, supported the constant-flux assumption for neutral conditions. For periods of instability, the stability corrections applied to the vertical variation of epsilon resulted in the proper adjustments toward the predicted slope. The shape of a spectrum of temperature fluctuations was in agreement with predictions. (Modified author abstract) GRA

N74-26122# Naval Postgraduate School, Monterey, Calif.
RADIATIVE PARAMETERIZATION FOR THE FNWC GLOBAL PRIMITIVE EQUATION MODEL M.S. Thesis
Frank Wright Jenks, III Mar. 1974 89 p refs
(AD-776304) Avail: NTIS CSCL 04/2

The study was an evaluation of a radiational scheme for inclusion in a numerical weather prediction model. This scheme uses empirical formulations for atmospheric absorptivities, scattering and reflectivity and cloud and earth surface reflectivity to compute the solar insolation received and absorbed by the earth and key atmospheric layers. Longwave cooling by the earth is also treated with empirically derived emissivities for water-vapor and carbon dioxide. This radiation model includes a two-layer cloud parameterization scheme and calculates the effect of an additional cloud layer on previous studies. (Modified author abstract) GRA

N74-26123# Naval Postgraduate School, Monterey, Calif.
THE INCLUSION OF MOISTURE IN A NUMERICAL MODEL OF STEADY-STATE FRONTS M.S. Thesis
Clifford James Cornelius, Jr. Mar. 1974 75 p refs
(AD-776311) Avail: NTIS CSCL 04/2

The numerical frontogenesis model of Williams is modified to include moisture with its subsequent condensation and release of latent heating. The turbulent diffusions of momentum, heat and moisture are represented with various coefficients. The numerical solutions show realistic quasi-steady fronts forming within one to two days. These solutions are examined and compared over a range of the various coefficients, and various ranges of temperature. Inclusion of moisture in the model causes intensification of baroclinicity at mid and upper levels. Also noted is a sensitivity of the moist model to reference potential temperature due to the exponential relationship between saturation vapor pressure and temperature. Author (GRA)

N74-26124# National Climatic Center, Asheville, N.C. Final Report
CEILING-VISIBILITY CLIMATOLOGICAL STUDY AND SYSTEMS ENHANCEMENT FACTORS (BASED ON HOURLY OBSERVATIONS)
Jun. 1973 102 p
(Contract DOT-FA73WAI-330)
(AD-776871) Avail: NTIS CSCL 04/2

The climatological data presented herein are intended to assist the Federal Aviation Administration in making Instrument Landing Systems (ILS) investment decisions. A special study prepared by the Aviation Policy Division of the FAA describes the decision model used in the benefit/cost program to support requests for ILS facilities. The tables contained in this report are designed to present the seasonal and diurnal variability of the various ceiling-visibility conditions and system enhancement factors. Each table contains an explanation of the data presented as well as the number of hourly observations examined to develop the percentages. GRA

N74-26125# National Climatic Center, Asheville, N.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS, WESTERN EUROPEAN COASTAL MARINE AREAS. VOLUME 5: AREA 24, ESBJERG; AREA 25, DOGGER BANKS; AREA 26, NORTH SEA; AREA 27, SHETLAND IS. SE; AREA 28, STAVANGER; AREA 29, BERGEN; AREA 30, ALESUND
Jan. 1974 568 p Sponsored by Naval Weather Service Command
(AD-776396) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from Tape Data Family 11 (TDF-11) Marine Surface Observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of Coastal Marine Summaries. The report concerns Western European Coastal Marine Areas, namely, Esbjerg, Dogger Banks, North Sea, Shetland Is. SE, Stavanger, Bergen, Alesund. GRA

N74-26126# Nevada Univ., Reno. Lab. of Atmospheric Physics.
AN EXPERIMENTAL STUDY OF THE FREEZING OF DROPS IN FREE FALL Final Report, 5 Jun. 1970 - 4 Sep. 1973
Thomas E. Hoffer and Marc L. Pitchford Jan. 1974 50 p refs
(Grant DA-ARO(D)-31-124-70-G81)
(AD-776390; AROD-9095-1-EN) Avail: NTIS CSCL 04/2

One process to explain natural ice pellets in the atmosphere is the heterogeneous freezing of large cloud drops. These experiments show that this process is of little importance. Drops of about 180 micrometer diameter which fell through high concentrations of aerosol nucleating particles showed consistantly very low percentages of freezes. From the information gathered a temperature threshold for lead iodide and phloroglucionol of -10C and -6C respectively was determined. Also a dependence on the relative humidity of the air in the vicinity of particle collection was observed. This gave rise to relative humidity thresholds of 65% for lead iodide and 75% for phloroglucionol. The nucleating ability of airborne ice crystals was experimentally tested and found to be much lower than expected. This difference is attributed to a collection efficiency for drops collecting non-spherical ice crystals, which is much lower than a calculated collection assuming the ice to be spherical. Author (GRA)

N74-26127# Environmental Technical Applications Center (Air Force), Washington, D.C.
US NAVAL WEATHER SERVICE WORLD-WIDE AIRFIELD SUMMARIES: VOLUME 11: EASTERN EUROPE AND USSR: PART 1: EASTERN EUROPE
Apr. 1973 480 p
(AD-776611) Avail: NTIS CSCL 04/2

The volume is part of a series of compilations which is world-wide in scope. It consists of climatological summaries for selected airfields and for the climatic areas in which they are located. This volume provides climatological summaries for airfields and climatic areas in Eastern Europe and U.S.S.R. GRA

N74-26128# Environmental Technical Applications Center (Air Force), Washington, D.C.
US WEATHER SERVICE WORLD-WIDE AIRFIELD SUMMARIES: VOLUME 11: EASTERN EUROPE AND USSR: PART 2: USSR
Apr. 1973 483 p refs
(AD-776612) Avail: NTIS CSCL 04/2

The volume is part of a series of compilations which is world-wide in scope. It consists of climatological summaries for selected airfields, and for the climatic areas in which they are located. This volume provides climatological summaries for airfields and climatic areas in U.S.S.R. GRA

N74-26129# Naval Postgraduate School, Monterey, Calif.
NUMERICAL PREDICTION OF THE MEAN WIND OVER WATER WAVES M.S. Thesis
Kenneth G. Dunning Mar. 1974 48 p refs
(AD-776314) Avail: NTIS CSCL 04/2

Stauffer (1973) developed a theoretical model for the prediction of the air flow above ocean waves. In this study his results were extended with the addition of buoyancy effects and two different lower boundary conditions. The numerical solutions show general agreement with the observational analyses of wave modified wind profiles by Davidson (1974). However, these comparisons are not conclusive because of the sensitivity in the lower boundary conditons. (Modified author abstract) GRA

N74-26130# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODIFICATION OF CONVECTIVE CLOUDS BY JETS
N. I. Vulfson and A. V. Kondratova 25 Feb. 1974 28 p refs
Transl. into English from Tr. v Vsesoyuznogo Meteorol. Sezda, Sekts. Aktivn Vozdeistvii na Atm. Protsessy (USSR), v. 4, 1972 p 62-78
(FTD Proj. T74-01-20)
(AD-776730; FTD-MT-24-217-74) Avail: NTIS CSCL 04/2

Contents: Stimulation of convective cloud development by artificially created ascending jets; Breaking up cumulus clouds with descending jets. GRA

N74-26131# Army Electronics Command, Fort Monmouth, N.J.
MICROPHYSICAL EVOLUTION OF FOG
Richard D. H. Low Mar. 1974 29 p refs
(DA Proj. 1T1-61102-B-53)
(AD-776334; ECOM-5533) Avail: NTIS CSCL 04/2

There is a paucity of data on the microphysical structure and life history of fogs. In two documented field programs, the microphysical and meteorological data of five warm radiation and radiation-advection fogs were collected at regular time intervals from onset through dissipation. In this paper, the statistical parameters of the microphysical data are presented, and analyses made thereof with a view to delineating the formative, mature, and dissipative stages of fog evolution in terms of five parameters: droplet and cloud nucleus concentrations, liquid water content, visibility, and supersaturation. (Modified author abstract) GRA

N74-26132# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RESULTS FROM RESEARCH ON PROCESSES OF CLOUD FORMATION IN CHAMBERS
E. A. Aleksandrov, O. A. Volkovitskii, A. G. Laktionov, N. K. Nikiforova, V. V. Smirnov, and G. Ij Shchelchkov 25 Feb. 1974 25 p refs Transl. into ENGLISH from Tr. v Vses. Meterol. Sezda. Sekts. Aktivn. Vozdeistvii na Atmosfernye Protsessy (USSR), v. 4, 1972 p 130-145
(AD-776747; FTD-MT-24-223-74) Avail: NTIS CSCL 04/2

Contents: Investigation of the initial stage of formation of the spectrum of cloud drops; Investigation of local nonuniformities in microphysical characteristics of a fog; Results of experiments on modification of fog by condensation nuclei; Study of the diffusion of light aeroions on aerosol particles; Some results from investigation of the formation of the crystalline phase in a supercooled fog; New method for determining the concentration of the most active cloud condensation nuclei. GRA

N74-26133# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFLUENCE OF THE VERTICAL STRUCTURE OF THE WIND FIELD ON THE DEVELOPMENT OF CUMULUS AND CUMULONIMBUS CLOUDS
R. S. Pastushkov and S. M. Shmeter 8 Mar. 1974 25 p refs
Transl. into ENGLISH from Tr. v Vses. Meteorol. Sezda. Sekts. Aktivn. Vozdeistvii na Atm. Protessy (USSR), v. 4, 1972 p 178-192
(AD-776745; FTD-MT-24-227-74) Avail: NTIS CSCL 04/2

The mesostructure of the wind in the neighborhood of convective clouds was studied, and several basic characteristics of the wind fields are identified. Perturbations of wind close to cumulus clouds and in the Cb zone are calculated. Horizontal divergence of the wind in several orders of magnitude are cited from empirical data. The profile of vertical velocities, external wind shear, the stratification of temperature and humidity, boundary conditions, and turbulence are considered in a mathematical model to calculate the thermodynamic properties of a convective cloud. A.A.D.

N74-26134# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN MISSILE NO. 1755, ROUND NO. 636 AML (2 NOVEMBER 1973) Meteorological Data Report
Nov. 1973 18 p
(DA Proj. 1T6-65702-D-127)
(AD-776902; DR-800) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1755, Round Number 636 AML, are presented in tabular form. Author (GRA)

N74-26135# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL MODEL OF GENERAL CIRCULATION OF THE ATMOSPHERE OVER ONE HEMISPHERE
M. E. Shvets, L. R. Dmitrieva-Arrago, L. N. Magazenko, L. V. Samoilova, and B. Ye. Shneyerov 25 Feb. 1974 66 p refs
Transl. into ENGLISH from Tr. Gidrodin. Issled. Tsirkulyatsi i Atmosfery (USSR), no. 256, 1970 p 3-44
(AD-776752; FTD-MT-24-502-73) Avail: NTIS CSCL 04/2

The article outlines a scheme of the general circulation of the atmosphere which in its physical content differs from previous studies of this problem in that the cloudiness and humidity are not given but are rather determined in the process of integration of the appropriate equations. However, the temperature of the ocean is considered known from climatological data. GRA

N74-26136# Manchester Univ. (England). Dept. of Physics.
THE ROLE OF ELECTRICAL FORCES IN THE DEVELOPMENT AND DISSIPATION OF CLOUDS AND FOGS Final Technical Report
John Latham and M. H. Smith Dec. 1973 25 p refs
(Contract DAJA37-73-C-1623; DA Proj. 1T0-61102-B-53A)
(AD-777010; ERO-E-1430) Avail: NTIS CSCL 04/2

The final report contains a description of some theoretical studies of the influence of evaporation and drop-interactions on a rainshaft, and an assessment, resulting from the experiments, of the feasibility of dispersing fogs by electrical forces. The fog dissipation experiments have demonstrated that the presence of high charges on drops greatly increases the rate at which they coalescence with smaller droplets, and so grow. Subject to satisfactory resolution of some engineering problems it appears, on the basis of these experiments, that the introduction of charged drops can possibly provide a feasible technique for the dispersion of quiescent warm fogs over airport runways. Author (GRA)

N74-26137# Environmental Prediction Research Facility (Navy), Monterey, Calif.
SUMMARIES AND ABSTRACTS OF TROPICAL PUBLICATIONS OF THE NAVY WEATHER RESEARCH FACILITY AND ENVIRONMENTAL PREDICTION RESEARCH FACILITY, 1968 TO FEB. 1974
Mar. 1974 21 p
(AD-777048; ENVPREDRSCHF-Tech-Note-5-74) Avail: NTIS CSCL 04/2

Tropical weather phenomena are of vital concern to naval operating forces in many regions of the world. For this reason, tropical meteorology is an important area of study at the Environmental Prediction Research Facility. The broad purpose of this research is to develop forecasting techniques for particular phenomena and/or specific regions as aids for the operational Navy environmentalist concerned with forecasting in tropical zones. The objective of this Technical Note is to make Navy forecasters or other interested environmentalists aware of the publications produced by this facility in the area of tropical meteorology. GRA

N74-26138# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.

THE ZONALLY SYMMETRIC MOTION OF THE ATMOSPHERE
Donald A. Drew Aug. 1973 36 p refs
(Grant DA-ARO(D)-31-124-G150; ARPA Order 2069)
(AD-776966; IMM-401) Avail: NTIS CSCL 04/2

The steady, zonally symmetric motion of a shallow incompressible atmosphere on a rapidly rotating earth subject to an equator-ward temperature gradient is studied. The assumptions made allow the thermodynamics to be treated separately from the motions. The turbulence terms are modelled using mixing length arguments. (Modified author abstract) GRA

N74-26139# Naval Weather Service Environmental Detachment, Asheville N.C.
US NAVAL WEATHER SERVICE WORLD-WIDE AIRFIELD SUMMARIES. VOLUME 12, PART 2: CHINA, NORTH KOREA, AND MONGOLIA
Feb. 1974 353 p refs
(AD-776616) Avail: NTIS CSCL 04/2

The volume is part of a series of compilations which is world-wide in scope. It consists of climatological summaries for selected airfields and for the climatic areas in which they are located. This volume provides climatological summaries for airfields and climatic areas in China, North Korea and Mongolia. GRA

N74-26140# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN MISSILE NO. 1779, ROUND NO. 638 AML, 26 NOVEMBER 1973 Meteorological Data Report
26 Nov. 1973 14 p
(DA Proj. 1T6-65702-D-127)
(AD-776907; DR-805) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1779, Round Number 638 AML, are presented in tabular form. Author (GRA)

N74-26141# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
ATMOSPHERIC STRUCTURE, WHITE SANDS MISSILE RANGE, NEW MEXICO. PART 1: SURFACE WIND, CLOUD COVER, VISIBILITY
Marjorie M. Hoidale and Lamar Newman Mar. 1974 165 p Revised
(DA Proj. 1T6-65702-D-127)
(AD-776908; DR-818-Pt-1) Avail: NTIS CSCL 04/2

A statistical analysis of surface wind velocity, sky conditions, and visibility is presented for A Station, White Sands Missile Range, New Mexico. This climatological information is based on the period of observation from 1951-1973. Author (GRA)

N74-26142# Pacific Missile Range, Point Mugu, Calif.
CLIMATIC HANDBOOK FOR POINT MUGU AND SAN NICOLAS ISLAND. PART 1: SURFACE DATA
Robert DeViolini 14 Mar. 1974 120 p refs Revised
(AD-777039; PMR-TP-74-1-Pt-1) Avail: NTIS CSCL 04/2

Surface climatic data relating to surface winds, sky cover, visibility, flying weather, temperature, relative humidity, precipitation, pressure, density, radar refraction, solar radiation, air contaminants, and atmospheric electricity are summarized in this handbook. In addition, brief station histories, comments on water and air temperatures over the Sea Test Range, tropical storm activity, and a glossary of terms are included. Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-26143+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands). Navigation Oceanography Section.
SATELLITE-NAVIGATION. SPECIFIC SEA-, AIR-, OCEANOGRAPHICAND GEODETIC APPLICATIONS. SECOND BIBLIOGRAPHY, JANUARY 1965 - JANUARY 1972
H. J. Bos, comp. May 1972 143 p refs Partly in ENGLISH; partly in FRENCH; partly in GERMAN; and partly in DUTCH Supplement to TDCK-43209
(TDCK-59377; TDCK-43209) Avail: NTIS HC $10.25

A title index on the state of the art of satellite navigation is presented, covering the period January 1965 to January 1972, and is subdivided into 7 chapters. Apart from marine, air, and oceanographic aspects, the specific geodetic (Secor) applications have been dealt with, whereas the transit (N.N.S.S.) navigation system, and the Doppler navigation techniques have been treated separately. Special attention has been given to satellite mechanics. ESRO

N74-26144*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER MARS 1971 OPTICAL NAVIGATION DEMONSTRATION Final Report
G. H. Born, T. C. Duxbury, W. G. Breckenridge, C. H. Acton, S. Mohan, N. Jerath, and H. Ohtakay 15 Apr. 1974 333 p refs
(Contract NAS7-100)
(NASA-CR-138453; JPL-TM-33-683) Avail: NTIS HC $19.75 CSCL 17G

The feasibility of using a combination of spacecraft-based optical data and earth-based Doppler data to perform near-real-time approach navigation was demonstrated by the Mariner Mars 71 Project. The important findings, conclusions, and recommendations are documented. A summary along with publications and papers giving additional details on the objectives of the demonstration are provided. Instrument calibration and performance as well as navigation and science results are reported. Author

N74-26145*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
PRECISION STATE AND FILTER WEIGHTING MATRIX EXTRAPOLATION, REVISION 3 Space Shuttle GN and C Equation Document No. 4
William M. Robertson Oct. 1972 36 p refs revised
(Contract NAS9-10268)
(NASA-CR-134278) Avail: NTIS HC $5.00 CSCL 17G

The matrix extrapolation routine presented is a coded algorithm for the numerical solution of modified forms of the basic differential equations which are satisfied by the geocentric state vector of a spacecraft's center of mass and by the filter-weighting matrix. The equations are described in detail and the various input and output variables designated. The capability is thus established to extrapolate any spacecraft's geocentric state vector, either backwards or forwards in time, through a force field consisting of the earth's primary central-force gravitational attraction, and a superimposed perturbing acceleration. A.A.D.

N74-26146*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
SHUTTLE UNIFIED NAVIGATION FILTER, REVISION 1 Space Shuttle GN and C Equation Document no. 21
Eugene S. Muller, Jr. Jul. 1973 96 p refs Revised
(Contract NAS9-10268)
(NASA-CR-134276) Avail: NTIS HC $8.00 CSCL 17G

Equations designed to meet the navigation requirements of the separate shuttle mission phases are presented in a series of reports entitled, Space Shuttle GN and C Equation Document. The development of these equations is based on performance studies carried out for each particular mission phase. Although navigation equations have been documented separately for each mission phase, a single unified navigation filter design is embodied in these separate designs. The purpose of this document is to present the shuttle navigation equations in a form in which they would most likely be coded-as the single unified navigation filter used in each mission phase. This document will then serve as a single general reference for the navigation equations replacing each of the individual mission phase navigation documents (which may still be used as a description of a particular navigation phase). Author

N74-26147*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.

CONIC STATE EXTRAPOLATION Space Shuttle GN and C Equation Document No. 25
Stanley W. Shepperd and William M. Robertson Jun. 1973 41 p refs
(Contract NAS9-10268)
(NASA-CR-134281) Avail: NTIS HC $5.25 CSCL 17G

The Conic State Extrapolation Routine provides the capability to conically extrapolate any spacecraft inertial state vector either backwards or forwards as a function of time or as a function of transfer angle. It is merely the coded form of two versions of the solution of the two-body differential equations of motion of the spacecraft center of mass. Because of its relatively fast computation speed and moderate accuracy, it serves as a preliminary navigation tool and as a method of obtaining quick solutions for targeting and guidance functions. More accurate (but slower) results are provided by the Precision State Extrapolation Routine. Author

N74-26148*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
STATION-KEEPING GUIDANCE Space Shuttle GN and C Equation Document No. 18
Donald E. Gustafson and Bernard A. Kriegsman Mar. 1972 26 p refs
(Contract NAS9-10268)
(NASA-CR-134280) Avail: NTIS HC $4.50 CSCL 17G

The station-keeping guidance system is described, which is designed to automatically keep one orbiting vehicle within a prescribed zone fixed with respect to another orbiting vehicle. The active vehicle, i.e. the one performing the station-keeping maneuvers, is referred to as the shuttle. The other passive orbiting vehicle is denoted as the workshop. The passive vehicle is assumed to be in a low-eccentricity near-earth orbit. The primary navigation sensor considered is a gimballed tracking radar located on board the shuttle. It provides data on relative range and range rate between the two vehicles. Also measured are the shaft and trunnion axes gimbal angles. An inertial measurement unit (IMU) is provided on board the orbiter. The IMU is used at all times to provide an attitude reference for the vehicle. The IMU accelerometers are used periodically to monitor the velocity-correction burns applied to the shuttle during the station-keeping mode. The guidance system is capable of station-keeping the shuttle in any arbitrary position with respect to the workshop by periodically applying velocity-correction pulses to the shuttle. Author

N74-26149# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROWAVE LANDING SYSTEM INTEGRATION STUDY. VOLUME 1: SUMMARY REPORT Final Report, 25 Jun. 1973 - 4 Mar. 1974
Edward Andrews, Jr., John E. Arnold, Charles R. Brittain, Garth R. Cooke, William M. Curran, Phillip H. Hermes, Gerald K. Hobart, John M. Molnar, John F. Schleich, and Jack L. Wolff 4 Mar. 1974 85 p refs
(AF Proj. 404L)
(AD-775703; GSE/SE/74-1-Vol-1) Avail: NTIS

The integration of the Microwave Landing System (MLS) into a representative selection of United States Air Force aircraft is investigated to identify problems affecting Air Force requirements for MLS. Antenna configurations and signal processing and interface designs are developed for the C-130E, C-5A, FB-111A, and F-15. These configurations and designs provide data for the environmental, cost, and systems effectiveness analyses presented in this report. A comparative analysis of different approach capabilities is carried out, using the C-130E as an illustration. These capabilities include straight, curved, and stepped approach paths as well as approaches into forward operating bases. (Modified author abstract) GRA

N74-26150*# Kanner (Leo) Associates, Redwood City, Calif.
FLIGHT PATH CONTROL EQUIPMENT FOR PRODUCING CURVED FLIGHT PATH PROFILES WITH MICROWAVE LANDING SYSTEMS
G. Schaenzer Washington NASA Jun. 1974 34 p refs Transl. into ENGLISH from the German report DGLR-73-016 Presented at the DGLR-DGON Symp. on New Approach and Landing Tech., Duesseldorf, 2-4 May 1973
(Contract NASw-2481)
(NASA-TT-F-15608; DGLR-73-016) Avail: NTIS HC $4.75 CSCL 17G

The characteristics of a flight path control instrument for producing curved approach profiles and guidance along these profiles are presented. For safety reasons, steep noise abatement approaches must be flown along curved profiles. The problems of flyabcity, accuracy, and the requirements to be placed on the IFR beacon system and on the flight control system are derived. Flight tests have shown that the techniques discussed contribute to a reduction in the burden on the pilot. Author

N74-26151*# Kanner (Leo) Associates, Redwood City, Calif.
DESIGN STUDY OF AN ELECTRONIC LANDING DISPLAY FOR STOL AIRCRAFT
W. Holstein Washington NASA Jun. 1974 30 p refs Transl. into ENGLISH from the German report DGLR-73-038 Presented at the DGLR-DGON Symp. on New Approach and Landing Tech., Duesseldorf, 2-4 May 1973
(Contract NASw-2481)
(NASA-TT-F-15618; DGLR-73-038) Avail: NTIS HC $4.50 CSCL 17G

The design of landing display devices for STOL aircraft was investigated. A proposal is made for a contact analog landing display, which includes the perspective representation of mean flight path, information about actual flight status, predisplay of flight path coordinates, and boundary values for flight parameters. An approach procedure using the improved display is described. Author

N74-26152# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
G-200 BEARING: AN ANALYSIS CONCERNING THE RELIABILITY OF AN INEXPENSIVE PART AND ITS EFFECT ON DEPOT LEVEL REPAIR COATS M.S. Thesis
John W. Burt and Robert T. Benbow Jan. 1974 109 p refs
(AD-775691; SLSR-13-74A) Avail: NTIS CSCL 17/7

Little management attention has been paid to inexpensive parts critical to the operation of defense weapons systems that incur large maintenance costs. This Costly Replacement of Inexpensive Parts (CRIP) concept was analyzed in one instance; the G-200 gyroscope bearin- of the LN-12 platform. The CRIP concept was supported in the case of the G-200 bearings. These precision instrument bearings did in fact represent an inexpensive part ($38 each) that was critical to the effectiveness of an aircraft's inertial guidance system and generated high replacement costs when failures occurred. GRA

N74-26153# Northrop Corp., Hawthorne, Calif. Electronics Div.
OMEGA NAVIGATION SET AN/ARN-99 (XN-2) Final Engineering Report on Phase 2, Feb. 1968 - Dec. 1973
Dec. 1973 409 p refs
(Contract N00019-68-C-0355)
(AD-775598; NORT-73-89) Avail: NTIS CSCL 17/7

The report documents the signal processing hardware (1) as an overview of functional characteristics, (2) in terms of signal processing and filtering dynamics, and (3) in terms of electrical design and mechanical construction. The hardware so described includes the Antenna/Coupler, the three-channel OMEGA Receiver, and the Control-Indicator Panel. The computer software, which performs the major procdssing tasks of automatic synchronization at turn-on, continuous signal tracking and Kalman filtering, propagation prediction and global navigation, is described in flow diagrams and by the basic mechanization equations from which the software programs were derived. The software control of the receiver hardware by the functions of antenna switching, self test and system calibration during interburst periods is similarly treated, as are the Control and Indicator input/output procedures. (Modified author abstract) GRA

N74-26154# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROWAVE LANDING SYSTEM INTEGRATION STUDY. VOLUME 2. ENGINEERING AND COST ANALYSIS REPORT Final Report, 25 Jun. 1973 - 4 Mar. 1974
Edward Andrews, Jr., John E. Arnold, Charles R. Brittain, Garth

R. Cooke, and William M. Curran Mar. 1974 269 p refs
(AF Proj. 404L)
(AD-775711; GSE/SE/74-1.Vol-2) Avail: NTIS CSCL 17/7

The integration of the MLS into the avionics subsystems of selected Air Force aircraft was investigated in this study. Antenna configurations and signal processing and interface designs were developed. These designs were the basis for avionics environment, cost, and system effectiveness analysis of the retrofit of MLS into the C-130E, C-5A, FB-111A, and the F-15. The C-130E study was used for the comparative analysis of different approach capabilities and MLS configurations. GRA

N74-26155# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROWAVE LANDING SYSTEM INTEGRATION STUDY. VOLUME 3: APPENDICES Final Report, 25 Jun. 1973 - 4 Mar. 1974
Edward Andrews, Jr., John E. Arnold, Charles R. Brittain, Garth R. Cooke, William M. Curran, Phillip H. Hermes, Gerald K. Hobart, John M. Molnar, John F. Schleich, and Jack L. Wolff 4 Mar. 1974 258 p refs
(AF Proj. 404L)
(AD-775724; GSE/SE/74-1.Vol-3) Avail: NTIS CSCL 17/7

Contains computer programs and data in support of the study. GRA

N74-26156# Naval Electronics Lab. Center, San Diego, Calif.
DIFFERENTIAL OMEGA NAVIGATION FOR THE US COASTAL CONFLUENCE REGION. PART 1: OVERVIEW Research and Development Report, Apr. - Nov. 1973
E. R. Swanson, D. J. Adrian, and P. H. Levine 2 Jan. 1974 18 p refs
(XF21232020)
(AD-777041; NELC-TR-1905-Part-1) Avail: NTIS CSCL 17G

Differential Omega is a navigation system based upon the real-time dissemination of Omega corrections for an area around a monitor site at a known location. This investigation of its potential for meeting Navy navigational requirements in the U.S. coastal confluence region (CCR), where traffic patterns tend to converge, finds that a system of 29 base stations - only one of them new -- would provide CCR coverage with cross-track accuracy of about 1/4 nmij Station spacing proposed for the Gulf of Mexico provides accuracy of 1/4 nmi or better throughout the fairway area. The publication of a series of volumes on differential Omega is projected. Author (GRA)

N74-26157# Naval Electronics Lab. Center, San Diego, Calif.
DIFFERENTIAL OMEGA NAVIGATION FOR THE US COASTAL CONFLUENCE REGION. PART 2: REQUIREMENTS, ACCURACIES, AND SYSTEM DEFINITION Research and Development Report, Apr. - Nov. 1973
E. R. Swanson, D. J. Adrian, and P. H. Levine 2 Jan. 1974 136 p refs
(XF21232020)
(AD-777043; NELC-TR-1905-Part-2) Avail: NTIS CSCL 17/7

Differential Omega is a navigation system based upon the real-time dissemination of Omega corrections for an area around a monitor site at a known location. This investigation of its potential for meeting Navy navigational requirements in the U.S. coastal confluence region (CCR), where traffic patterns tend to converge, finds that a system of 29 base stations--only one of them new--would provide CCR coverage with cross-track accuracy of about 1/4 nmi. Station spacing proposed for the Gulf of Mexico provides accuracy of 1/4 nmi or better throughout the fairway area. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-26158# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Energy Conversion Research Lab.
FEASIBILITY OF COLLOID CORE NUCLEAR REACTOR FOR ROCKET PROPULSION Final Report
Bobby N. Turman and James M. Howard Dec. 1973 93 p refs
(AF Proj. 7116)
(AD-776767; ARL-73-0192) Avail: NTIS CSCL 21/6

An in-depth study has been conducted to determine the feasibility of the colloid core nuclear reactor (CCNR) for rocket propulsion. Investigations of powder containment, reactor criticality, nuclear fuel vaporization, heat transfer, and wall erosion are discussed. Results are scaled and integrated to specify an optimized design reactor rocket engine. Rocket engine performance is evaluated with respect to velocity capability, type of fuel, and fuel loss rate. It is concluded that the CCNR rocket engine is technically feasible, that a thrust-to-weight ratio of 6:1 is obtainable at 20,000 lb thrust, and that the maximum specific impulse cannot exceed 1020 sec. Furthermore, results indicate that the CCNR shows significant performance advantages over chemical and other nuclear rocket engines for missions requiring payloads on the order of 10,000 lb, with large excess velocity capabcity. Recommendations are made as to the steps necessary to the further development of the colloid core nuclear reactor rocket. Author (GRA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-26159 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON THE OPTICAL ABSORPTION AND LUMINESCENCE OF X-IRRADIATED ALKALI SULPHATES DOPED WITH Cd^{2+} OR Zn^{2+}
M. Kaira (Turku Univ., Finland) and R. Laiho (Turku Univ., Finland) 1973 10 p refs
(ISBN-951-41-0144-8; Rept-405) Copyright. Avail: Issuing Activity

Cadmium- and zinc-doped alkali sulphate crystals were X-irradiated at room temperature and investigated by optical absorption, emission and circular dichroism methods. A strong absorption band was identified at 250 nm in the irradiated K_2SO_4 Rb_2SO_4 and Cs_2SO_4 crystals. When excited at 340 nm, the irradiated cadmium-doped crystals emitted light with the peak of the emission band at about 580 nm. These data and the observed circular dichroism of the absorption were assigned to the formation of perturbed $O_2(-)$ molecule-ions as a result of X-irradiation. Similar properties wdre not observed in doped Na_2SO_4 crystals. Author

N74-26160 Minnesota Univ., Minneapolis.
THEORY OF MILLIMETER MICROWAVE NONLINEAR HARMONIC GENERATION AND ITS APPLICATIONS Ph.D. Thesis
Fuchuan Chen 1973 66 p
Avail: Univ. Microfilms Order No. 74-10634

A nonhomogeneous partial differential equation describing microwave harmonic generation is formulated. This equation applies to the case of a nonlinear dielectric filling a rectangular waveguide. It is then demonstrated that a transversely-magnetized n-type indium antimonide magnetoplasma filling a rectangular waveguide can be treated as a nonlinear scalar dielectric under high dc magnetic field conditions. Three different experiments were performed. All harmonic generation experiments were performed at a temperature of 77 K and at a fundamental frequency of 24 GHz. The results show agreement between the theory and the low level experiment. Dissert. Abstr.

N74-26161# National Bureau of Standards, Washington, D.C. Heat Div.
OPTICAL RADIATION MEASUREMENTS: TABLES OF DIFFRACTION LOSSES Final Report
W. B. Fussell Jun. 1974 38 p refs
(NBS-TN-594-8) Avail: NTIS Avail: SOD HC $0.75 as C13.46:594-8

Tables of diffraction losses are given for a range of typical experimental geometries for wavelengths from 0.2 to 100 micrometers. The scaling relationships for the diffraction losses for varying wavelengths and geometries are also given, and sample calculations are presented. General formulas are given for the diffraction losses; the formulas are derived from the Kirchhoff scalar paraxial diffraction theory. The accuracy of the tabulated values is estimated. Author

N74-26162# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE TRANSMISSION OF LIGHT THROUGH A TURBULENT LIQUID
S. S. Kutateladze and D. I. Avaliani Mar. 1973 3 p refs
Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 206, no. 2, 1972 p 311-312
(NTC-74-11896; Rept-73-62) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A mathematical model for the effects of temperature and pressure ulsations on turbulent fluid flow is developed. The Lorentz-Lorenz formula is employed to determine the relation of the refractive index of light to the density of the medium. The mathematical relationships make it possible to estimate the order of the magnitudes and the structure of the scattering of light from the turbulent fluctuations in the medium as a function of its physical properties and hydrodynamic parameters. Author

N74-26163*# Kanner (Leo) Associates, Redwood City, Calif.
OPTICAL-MECHANICAL ANALOGY
O. G. Onishchenko Washington NASA Jun. 1974 11 p refs Transl. into ENGLISH of "K Optiko-Mekhanicheskoy Analogii", Rept. PR-148 Inst. of Space Res., Acad. Sci. USSR, Moscow, 1974 10 p
(Contract NASw-2481)
(NASA-TT-F-15667; PR-148) Avail: NTIS HC $4.00 CSCL 20N

The propagation of an electromagnetic wave in a spherically refracting medium is considered on the basis of the optical-mechanical analogy between the trajectory of the ray, and the trajectory of a material particle. This analogy is then used to determine the refractive index of the medium. Refraction of radio waves in the solar corona is considered as an example. Author

N74-26164# Electrotechnical Lab., Tokyo (Japan).
IRRADIATION EFFECT IN SUPERCONDUCTING MAGNETS
Toshitada Onishi Nov. 1973 61 p refs In JAPANESE; ENGLISH summary
(Circ-175) Avail: NTIS HC $6.25

The results of experiments to determine the effects of radiation on superconductors such as copper or aluminum are reported. The extent of the radiation damage, and the influence of irradiation on the resistivity in the conducting metals are discussed along with the effects on the critical current density, critical field, and critical temperature of various superconductors. The stability of composite superconductor is also discussed. Author

N74-26165# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN INTERFEROMETRIC INVESTIGATION OF THE PHASE FLUCTUATIONS IN COHERENT OPTICAL RADIATION WITHIN THE ATMOSPHERE
T. I. Arsenyan and F. F. Pashkov Feb. 1973 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (Gorki), v. 15, no. 8, 1972 p 1228-1232
(NTC-74-11944; Rept-73-71) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Investigation results of the phase fluctuation for coherent optical radiation as it propagates through a random nonuniform troposphere are shown. These results were obtained using an Zhamen interferometer. An analysis was made of the structural phase fluctuation function as a function of the spacing of the base line of the interfering beam. It was shown that the degree of divergence between the theoretical and experimental functions was determined by the intensity of turbulence along the track. It was shown that the variance in the phase was a strong function of the meteorological conditions along the track, in particular, on the speed of the transverse movement and track length. Author

N74-26166# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE KIRCHHOFF-FRESNEL DIFFRACTION IN TURBULENT ATMOSPHERE
A. A. Kashkan and Yu. M. Polishchuk Apr. 1973 9 p refs
Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Radiofiz. (Gorki), v. 15, no. 5, 1972 p 732-737
(NTC-74-11943; Rept-73-95) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Fluctuations of the Kirchhoff-Fresnel field on a hole in a flat opaque screen, located in a turbulent atmosphere, are examined. The concept of the space-frequency characteristic of the hole is used to solve the problem. The correlation functions of the relative fluctuations of the complex attenuation factor are calculated assuming isotropic fluctuations of the dielectric permeability of the atmosphere. The results obtained are used for calculating the statistical characteristics of the half-plane attenuation factor. Author

N74-26167# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON A METHOD FOR MEASURING THE REFLECTION COEFFICIENTS OF MIRROR SURFACES
L. A. Ageyev and I. N. Skhylarevskii Mar. 1973 6 p refs
Transl. into ENGLISH from Zh. Prikl. Spektrosk. (USSR), v. 16, no. 2, 1972 p 376-378
(NTC-74-11951; Rept-73-92) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The difficulties involved in measuring the spectral dependence of the coefficients of light reflection from various types of mirror surfaces are discussed. A device which is attached to a spectral photometer to permit making the optical measurements is described. The procedure for conducting the measurements is explained. A diagram of the optical circuit is provided and mathematical models of the optical parameters are developed. Author

N74-26168# Naval Electronics Lab. Center, San Diego, Calif.
WAVEGUIDE TECHNIQUES FOR INTEGRATED OPTICS Research and Development Report, 1 Apr. - 30 Sep. 1973
W. M. Caton and T. G. Pavlopoulos Jan. 1974 34 p refs
(ARPA Order 2158)
(AD-777029; NELC-TR-1909) Avail: NTIS CSCL 20/6

The advancement of integrated optics circuits and fiber optics with a view to their application in Navy and other DoD systems is the objective of this ARPA-sponsored NELC program. This report documents progress in a number of areas. Patterns for direct optical waveguides have been fabricated in different materials by electron beam exposure of electron resist. Studies have been performed on the efficiency of planar horn-shaped regions in waveguides as coupling devices. An electron beam microscope has been used to measure the variation in the concentration of the electrically active impurities in laser diodes and other semiconductor structures. An apparatus has been constructed foı the measurement of the refractive index of thin films. Low-loss channel waveguides have been produced by focusing an argon ion cw laser with the aid of a microscopic objective on the surface of a piece of highly absorbing glass. (Modified author abstract) GRA

N74-26169# European Space Research Organization, Paris (France).
ATOMIC HYDROGEN
R. Hess Apr. 1974 101 p refs Transl. into ENGLISH of Atomarer Wasserstoff, DLR-FB-73-74, DFVLR, 6 Jun. 1973
(ESRO-TT-42; DLR-FB-73-74) Avail: NTIS HC $8.25; DFVLR, Porz, West Ger. 33.20 DM

The stabilization of atomic hydrogen at high densities over long periods is discussed. Atomic hydrogen would be an excellent energy store and the stored energy per unit mass would be far above other means of storage. Past and present results are given together with the motivation for the projected development in the next two years. ESRO

N74-26170# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics and Materials Science.
MODULATION OF ACOUSTIC WAVE BY TURBULENT SHEAR FLOW
Ho Chih-ming and Leslie S. G. Kovaszay Feb. 1974 206 p refs

(Contract F44620-69-C-0023; AF Proj. 9781)
(AD-776084; AFOSR-74-0365TR) Avail: NTIS CSCL 20/1

The collimated monochromatic and coherent acoustic wave, (a sine wave of 3 KHz-90 KHz), was directed perpendicularly across a two-dimensional turbulent jet. Extensive study of the statistical properties of both the turbulent flow and of the received wave (amplitude and phase modulation) offers physical insight into the general phenomenon of a periodic pressure field scattered by a random solenoidal velocity field. In addition, there is strong indication that the acoustic wave may be used as a diagnostic tool for measuring some statistical properties of the turbulence velocity field. Author (GRA)

N74-26171# Stanford Research Inst., Menlo Park, Calif.
MATERIALS PROCESSING OF RARE EARTH-COBALT PERMANENT MAGNETS Final Report, 1 Jan. - 30 Sep. 1973
Paul J. Jorgensen and Robert W. Bartlett Wright-Patterson AFB, Ohio AFML Jan. 1974 139 p refs
(Contract F33615-70-C-1624; ARPA Order 1617; SRI Proj. PYU-8731)
(AD-775719; AFML-TR-74-2) Avail: NTIS CSCL 11/6

The RECo5 intermetallic compounds, where RE stands for one of the light rare earths, show a high magnetic saturation and very high magneto-crystalline anisotrophy. During the present program, alternative materials processing techniques were investigated in an effort to develop improved powder preparation methods. The methods investigated were (1) ball milling in a nonreactive liquid, (2) plasma spheroidization of alloy particles, (3) plasma annealing without melting alloy particles, (4) electrodeposition of rare earth-cobalt alloys, and (5) metallothermic reduction of rare earth-cobalt alloys. The primary material used in this study was SmCo5 but studies were also made on PrCo5 and MMCo5 containing major amounts of cerium. Oxidation and sintering of SmCo5 was discussed in detail. GRA

N74-26172# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMPARATIVE STUDY OF THE ELECTRICAL OSCILLATIONS IN POSITIVE AND NEGATIVE COLUMN IN A dc GLOW DISCHARGE
D. Grosu and X. Grosu 21 Mar. 1974 22 p refs Transl. into ENGLISH from Stud. Cercet. Fiziol. (Bucharest), v. 22, no. 4, 1970 p 409-420
(AD-776751; FTD-HC-23-1340-74) Avail: NTIS CSCL 20/3

Contents: Form, frequency, and amplitude of the electrical oscillation, the dependence of the electrical oscillation frequency on the length of the ionized column, dependence of the electrical oscillation frequency on the anode diameter, the influence of the voltage applied on the tube upon electrical oscillation frequency, the dependence of the electrical oscillation frequency on the tube diameter, influence of the tube discharge capacity upon the frequency of the electrical oscillation, and magnetic field influence on the electrical oscillation. GRA

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-26173*# California Univ., San Diego.
CONTRAST CHANGES IN FLUOROSCOPIC IMAGING SYSTEMS AND STATISTICAL VARIATIONS OF THESE CHANGES Final Report, 1 Oct. 1972 - 31 Oct. 1973
Norman A. Bailey 31 Oct. 1973 95 p refs
(Grant NGL-05-009-103)
(NASA-CR-138250) Avail: NTIS HC $7.75 CSCL 20H

Experimental studies have indicated that: (1) The response of digitized fluoroscopic imaging systems is linear systems is linear with contrast over a rather wide range of absorber and cavity thicknesses. (2) Contrast changes associated with the addition of aluminum, iodine containing contrast agents and air of thicknesses 1mm or less can be detected with a 95% confidence level. (3) The standard deviation associated with such determination using clinically available X-ray generators and video disc recording is less than 1 percent. A large flat screen X-ray image intensifier has been constructed and some preliminary results obtained. Sensitivity achieved makes dose reduction a factor often greater than previously reported for a system using a conventional X-ray image intensifier. Author

N74-26174# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.
ONE DIMENSIONAL STRUCTURE OF HADRONS
Masahiro Imachi, Shoichiro Otsuki (Kyushu Univ.), and Fumihiko Toyoda (Kyushu Univ.) Mar. 1974 9 p refs
(RIFP-189) Avail: NTIS HC $4.00

From the standpoint that hadron reactions take place through the rearrangement of urbaryons, the constituent of hadrons, the urbaryon rearrangement (URD) embodies essential features of hadron dynamics: duality, Regge exchange, resonance dominance, exotism. When the hypothesis that any hadron state should have zero triality is taken seriously, a quantity omega (called orientation) can be defined on every region separated bu urbaryon lines. The orientation omega is a kind of additive quantum number and attaches a new meaning to the URD. It is shown that not only the urbaryon line but also every region with definite omega separated by the lines plays physical roles. The region with omega not equal to 0 is called membrane, and a one dimensional structure of hadrons as a specified sequence of the urbaryon and the membrane is proposed. Planar URD's were considered and the investigation restricted to a two dimensional world (one time and one space dimension). Author

N74-26175*# Oregon Univ., Eugene. Dept. of Physics.
X-ALPHA CALCULATION OF TRANSITION ENERGIES IN MULTIPLY IONIZED ATOMS
D. A. Ringers and M. H. Chen [1974] 14 p refs Sponsored in part by AROD
(Grant NGR-38-003-036)
(NASA-CR-138460) Avail: NTIS HC $4.00 CSCL 20H

It is shown that the accuracy of calculations can be improved if appropriate (different) values of alpha are used for each configuration. Alternatively, the Slater Transition state can be used, wherein a total energy difference is related to a difference in single electron eigenvalues. By a series expansion, the value of alpha for an excited configuration can be related to its value for the ground state configuration. The terms Delta alpha (delta Epsilon/delta alpha) exhibit a similar dependence on atomic number as the ground state values of alpha. Results of sample calculations are reported and compared with experiment. Author

N74-26176# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE EFFECT OF FILM STRUCTURE ON THE CHARACTERISTICS OF SECONDARY ELECTRON EMISSION
Yu. N. Krynko and I. F. Koval Jan. 1973 9 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 17, no. 2, 1972 p 302-306
(NTC-74-11859; Rept-73-42) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Structure and surface profiles of Ge and Be films and the effect of this structure on the secondary emission characteristics were studied. The film structure was investigated in an electronic microscope. It is shown that at an oblique incidence of the substance atoms to the substrate surface consists of needle formations, the axis of which is directed towards the vapor beam incidence. The coefficients of the secondary electron emission and inelastic reflection of oblique-pulverized films is usually less than for normal-pulverized ones. The greatest difference is observed in the case when primary electrons hit the target in the direction of the needles. Author

N74-26177# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE INVESTIGATION OF THE SLOWING DOWN OF ELECTRONS IN Be AND Ge BY THE METHODS OF SECONDARY EMISSION
A. F. Makhov and A. A. Gutkin Feb. 1973 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Fiz. (USSR), no. 1, 1958 p 113-113
(NTC-74-11949) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Results are presented of the investigation of secondary emission from thin films of Be that were vapor deposited on a nickel substrate in a vacuum, and thin films of Ge deposited on Be. The secondary emission coefficient was measured for primary electron energies that varied from 100 to 4000 electron volts.
Author

N74-26178# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DRIFT VELOCITIES, DIFFUSION COEFFICIENTS AND TEMPERATURES OF PHOTOIONS IN ARGON, NITROGEN AND OXYGEN
P. Warneck Apr. 1973 23 p refs Transl. into ENGLISH from Z. Naturforsch. (Tubingen), v. 27A, 1972 p 1127-1135
(NTC-74-11925; Rept-73-124) Avail: NTIS HC $4.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Photoionization of argon, nitrogen and oxygen in a drift chamber is presented. After their traversal of the drift region, the ions were detected in a mass spectrometer. An analysis of the temporal arrival profiles provided ionic drift velocities and diffusion coefficients as a function of gas pressure and electric field. Drift velocities and diffusion coefficients provide ion temperatures as a function of the reduced field strength. Ion temperatures for argon ions correspond to the gas temperature. For nitrogen and oxygen ions the temperatures increase linearly with E/P and extrapolate at high fields to those given by Wannier's theory.
Author

N74-26179# Defence Research Establishment Valcartier (Quebec).
A THEORY OF DOPPLER AND BINARY COLLISION BROADENING BY FOREIGN GASES Ph.D. Thesis - Brussels Univ., Jun. 1973
P. L. Roney Dec. 1973 71 p refs
(DREV-R-703/73) Avail: NTIS HC $6.75

The quantum-mechanical theory of combined Doppler and foreign gas pressure broadening at the binary collision level is developed from the point of view of statistical mechanics. The problem is formulated in terms of the stationary state solution of a linearized kinetic equation. This equation takes into account the effects of photon recoil momentum, binary collision correlations, and the finite duration of collisions.
Author

N74-26180*# Maryland Univ., College Park. Space Physics Group.
THE DIFFUSIVE IDEALIZATION OF CHARGED PARTICLE TRANSPORT IN RANDOM MAGNETIC FIELDS
James A. Earl Apr. 1974 33 p refs
(Grant NGR-21-002-066)
(NASA-CR-138510; TR-74-078) Avail: NTIS HC $4.75

The transport of charged particles diffusing in a random magnetic field parallel to a relatively large guiding field is presented. The same coefficient of diffusion is obtained by three methods. Two corrections must be added to the expression in which the diffusive flux is proportional to the gradient of the density. Explicit expressions are given for a characteristic time and a characteristic length which describe the corrections. The well known divergence of the coefficient of diffusion, which is implied by the quasilinear analysis of pitch angle scattering, does not occur if the scattering rate is finite at 90 deg pitch angle. This effect is illustrated by formulas which give the coefficient of diffusion when the quasilinear expression is perturbed by a variable amount of isotropic scattering.
Author

N74-26181# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE ANALYTICAL EXPRESSION OF THE IONIZATION CROSS-SECTION FOR ATOM-ATOM COLLISIONS AND ON THE ION-ELECTRON RECOMBINATION IN DENSE NEUTRAL GASES
H. W. Drawin Jun. 1973 19 p refs Transl. into ENGLISH from Z. Physik (Berlin), v. 211, no. 4, 1968 p 404-417
(NTC-74-11910; Rept-73-148) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Calculation of ionization cross sections in electron-atom encounters is presented. Calculation of the ionization cross-sections for atom-atom collisions is viewed. A formula is obtained permitting a rapid calculation of the total ionization cross-sections as a function of the kinetic energy and the mass of the ionizing atom, and of the binding energy and the number of equivalent electrons in the electronic shell to be ionized. The formula is in agreement with quantum mechanical calculations and with experimental results.
Author

N74-26182# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MONTE CARLO CALCULATIONS OF ELECTRON DIFFUSION
L. Reimer Jul. 1973 18 p refs Transl. into ENGLISH from Optik (Stuttgart), v. 27, no. 2, 1968 p 86-98
(NTC-74-11934) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Elastic and inelastic scattering at angles larger than 10 deg and a continuous decrease in energy using a Bethe stopping formula is presented. The ionization and energy dissipation inside the target are calculated. Experimental results for the generation of heat under electron bombardment are in good agreement. Additional calculations of back-scattering are reported. These are of interest in discussing the image formation in a scanning electron microscope.
Author

N74-26183# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DRIFT VELOCITY AND MOBILITY OF ELECTRONS IN SILICON AT 4.2 K AS A FUNCTION OF ELECTRIC FIELD
P. Deimel Feb. 1973 13 p refs Transl. into ENGLISH from Z. Naturforsch. (West Germany), v. 27A, no. 1, 1972 p 26-30
(NTC-74-11907; Rept-73-67) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The pulse rise times of an n-type silicon surface barrier counter is investigated. At this temperature the detector was fully depleted even at very low bias and the measured pulse rise times gave direct information about the drift velocity and the mobility. At high electric fields, agreement exists with theory.
Author

N74-26184# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SILICON SURFACE-BARRIER DETECTORS OF THE TYPE dE/dx
V. V. Aveichikov, A. P. Zhigalov et al Mar. 1973 2 p Transl. into ENGLISH from Pribory i Tekhn. Eksperim. (Moscow), v. 15, no. 8, 1972 p 261
(NTC-74-11919; Rept-73-89) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Operating characteristics are listed for the dE/dx detectors, designed for measuring the specific ionization of charged particles in different systems, identifying their charge and mass, and determining the time zero in systems measuring transit time. Also mentioned is their application in the spectrometry of comparatively low energy charged particles under the conditions of a high neutron, beta and gamma background and heavy flows of fast particles.
Author

N74-26185*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE AVERAGE MOTION OF A CHARGED PARTICLE IN A DIPOLE FIELD
A. J. Chen and David P. Stern May 1974 15 p refs Submitted for publication
(NASA-TM-X-70668; X-602-74-166) Avail: NTIS HC $4.00 CSCL 20H

The numerical representation of the average motion of a charged particle trapped in a geomagnetic field is developed. An assumption is made of the conservation of the first two adiabatic invariants where integration is along a field line between mirror points. The averaged motion also involved the parameters defining the magnetic field line to which the particle is attached. Methods involved in obtaining the motion in the equatorial plane of model magnetospheres are based on Hamiltonian functions. The restrictions imposed by the special nature of the dipole field are defined.
Author

N74-26186# Naval Research Lab., Washington, D.C.
CROSS SECTIONS OF PROTON-NUCLEUS INTERACTIONS AT HIGH ENERGIES Interim Report
Rein Silberberg and Chen-Hsiang Tsao 21 Dec. 1973 69 p refs
(RR0120441)
(AD-777030; NRL-7593) Avail: NTIS CSCL 20/8

A comparison of cross sections induced by protons and He-4

is tabulated. Also a table of cross sections for (p, xn) reactions is given. These cross sections are useful for studies of interactions of cosmic rays and solar flare particles, as well as in radiation shielding and radiation therapy. These cross sections were used by the authors to develop semiempirical equations for calculating partial cross sections that have not yet been measured.
Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-26187 California Univ., San Diego.
SOME ASTROPHYSICAL PROBLEMS INVOLVING PLASMAS AND PLASMA-SOLID SYSTEMS. 1: ON THE MECHANISM OF FORMATION OF LOOP PROMINENCES. 2: ELECTRIC POTENTIAL ON SOLID SPHERES IN A PLASMA. 3: PHYSICAL CONDITIONS IN THE METEORITE CONDENSATION ENVIRONMENT. 4: ORIGIN OF THE OCEAN Ph.D. Thesis
Bibhas Ranjan De 1973 208 p
Avail: Univ. Microfilms Order No. 74-9833

Astrophysical problems dealing with the following are discussed: (1) formation of loop type prominences in solar active regions following flare events, (2) development of steady electric potential on a solid body immersed in a plasma, (3) temperature of condensing solids and ambient gas in a condensation environment, and (4) orgin of the ocean taking into consideration the plasma condensation orign of the material that now forms the earth.
Dissert. Abstr.

N74-26188*# Techtran Corp., Glen Burnie, Md.
INVESTIGATION OF THE PROCESS OF SIMPLE WAVE INVERSION IN AN ANISOTROPIC PLASMA
M. S. Ruderman Washington NASA Jun. 1974 21 p refs
Transl. into ENGLISH of Acad of Sci. USSR, Inst. of Res. (Moscow), report Pr-149, 1974 25 p
(Contract NASw-2485)
(NASA-TT-F-15671; PR-149) Avail: NTIS HC $4.25 CSCL 20I

The inversion path of simple waves in anisotropic plasma is determined on the basis of the Chew, Goldberg, and Low equations. The validity is examined of applying the linear theory to the question of heating of the outer solar corona by rapid magnetosonic waves.
Author

N74-26189# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
PROPAGATION OF SOLITARY WAVES IN A TWO ION SPECIES PLASMA WITH FINITE ION TEMPERATURE
M. Q. Tran Mar. 1974 19 p refs
(LRP-79/74) Avail: NTIS HC $4.00

The Korteweg-de Vries equation was used to study the propagation of ion acoustic solitary waves in a two ion species plasma where T sub i is not equal to 0. The dispersion relation presented two acoustic branches with quite different phase velocities from which two types of solution propagation were identified: the slow one, which is subsonic with respect to one ion mode and supersonic to the other, has greater amplitude and smaller width than the fast one.
Author

N74-26190# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VARIOUS STATES OF A PENNING-TYPE ELECTRICAL DISCHARGE AT VERY LOW PRESSURES
G. A. Boutry and P. Lebon Apr. 1973 6 p refs Transl. into ENGLISH from Comptes Rendus (Paris), B. v. 264, 1967 p 519-522
(NTC-74-11887; Rept-73-120) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The properties of a Penning-type electrical discharge between 5 x 10-5 and 5 x 10-8 mm of mercury were investigated, and the existence of two stable states of the discharge was demonstrated.
Author

N74-26191# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE THEORY OF ELECTRON BEAM INTERACTIONS WITH HELICONS IN SEMICONDUCTOR PLASMAS
V. M. Yavkovenko, S. I. Khankina et al Feb. 1973 11 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 17, no. 3, 1972 p 466-471
(NTC-74-11851; Rept-73-65) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The amplification of helicons in a bounded semiconductor was studied as a result of their interaction with a flow of charged particles passing over the sample surface. Growth increments are determined in two resonance cases: (1) the phase velocity of the helicons is close to the beam velocity: and (2) the helicon frequency is close to the displaced cyclotron frequency of the beam electrons.
Author

N74-26192# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INVESTIGATION OF THE INTERACTION OF A PLASMA STREAM WITH AN AXIALLY SYMMETRIC MAGNETIC FIELD
Yu. F. Kashkin Mar. 1973 7 p refs Transl. into ENGLISH from Zh. Prik. Mekhan. i Techn. Fiz. (Moscow), no. 3, 1972 p 37-39
(NTC-74-11916; Rept-73-91) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The motion is examined of a plasma stream in an axially symmetric magnetic field in the case of a magnetic Reynolds number approximately 10, a magndtic hydrodynamic interaction parameter approximately 1, and a Hall parameter approximately 1. The retardation of the flow in a round channel at the entrance to a magnetic field as a result of the formation of turns in the azimuthal electric current is also considered.
Author

N74-26193# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE CALCULATION OF THE REGION NEAR THE ELECTRODE IN A PLASMA WITH THE ADDITION OF AN ALKALI METAL
V. N. Mikhailov Mar. 1974 20 p refs Transl. into ENGLISH from Zh. Prik. Mekhan. i Techn. Fiz. (Moscow), no. 4, 1971 p 3-12
(NTC-74-11952; Rept-73-90) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The influence of certain processes occurring in a volume of gas and on the surface of electrodes are considered. The potential drop near an electrode in the case of discharge in a dense weakly ionized gas is investigated. The thermal electron emission from the electrode surface, the Schottky effect, diffusion, and also volumetric and surface ionization and recombination are taken into consideration. An analysis is conducted for the sufficiently simple geometry of a discharge gap being two infinite plane parallel electrodes. Relationships are obtained for calculating the potential drop near an electrode in a two temperature plasma as a function of the parameters of the discharge and the emission characteristics of the material.
Author

N74-26194# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
FLUTE STABILIZATION IN THE BOUNDARY LAYER OF AN IMPERMEABLE PLASMA
B. Lehnert Jan. 1974 28 p refs
(TRITA-EPP-74-04) Avail: NTIS HC $4.50

In a quasi-steady impermeable magnetically confined plasma, a partially ionized, dense, and cool boundary layer of finite size develops between the fully ionized plasma body and a surrounding neutral gas blanket. The dynamics of the plasma in this layer is strongly affected by the collision processes between all kinds of moderately high frequencies there is a strong plasma-neutral gas coupling, leading to an equivalent plasma viscosity. A simple localized analysis indicates that flute type perturbations should become completely stabilized by a joint viscosity-resistivity-pressure effect. If this result turns out to be applicable to full-scale fusion reactors, it should provide a flexible alternative to minimum average-B stabilization in the boundary layer.
Author (ESRO)

N74-26195# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
CURRENT LIMITING SPACE CHARGE SHEATHS IN A LOW

PRESSURE ARC PLASMA
M. Babic and S. Torven 23 Jan. 1974 46 p refs Sponsored by Swed. Board for Tech. Develop.
(TRITA-EPP-74-02) Avail: NTIS HC $5.50

A mercury arc with a long positive column and a current stabilizing external electric circuit was used. The arc current was increased very slowly at vapor pressures below 1 mTorr, and voltage pulses with large amplitudes and a typical duration of 10 microsec developed over the arc. The ac-voltage distribution along the column was measured by external capacitive probes. When the column was kept axially homogeneous, the voltage drops were found to be concentrated to a space charge sheath which forms a sharp and visible boundary across the column. For current levels just below the current leading to sheath formation, voltage pulses propagating with the ion sound speed could be detected in the region of the column where the sheath is formed. Author (ESRO)

N74-26196# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
BREAKDOWN AND PLASMA FORMATION IN A ROTATING PLASMA DEVICE
B. Bonnevier and A. H. Sillesen Mar. 1974 17 p refs Prepared jointly with Danish AEC
(TRITA-EPP-74-06) Avail: NTIS HC $4.00

Breakdown and formation of a plasma with high ion temperature were studied in the Puffatron at Riso. The conditions for plasma formation are along the same lines as breakdown in an ordinary crossed field discharge such as Penning, PIG, or magnetron discharge, where ions are not magnetically confined, as in the present experiment. The growth of ionization occurs much faster than expected from ionization by thermal electrons. This has been seen in some earlier rotating plasma experiments. It is suggested that work along the present lines can result in a time independent arc discharge, where ions have thermonuclear energies. Author (ESRO)

N74-26197# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics and Fusion Research.
THE BOUNDARY LAYER BETWEEN A ROTATING PLASMA AND A NEUTRAL GAS BLANKET
T. Hellsten and R. Raggi Feb. 1974 34 p refs Sponsored by Swed. Atomic Res. Council, Bank of Swed. Tercentenary Fund, and Intern. Seminar in Phys. and Chem.
(TRITA-EPP-74-07) Avail: NTIS HC $4.75

The boundary layer situated between a rotating hydrogen plasma of high density and a surrounding neutral gas was investigated by means of electric probes. The measured parameters were the electric field, the plasma density, and the electron temperature. The boundary layer has a fine structure defined by four limits: (1) The innermost limit is characterized by the fact that the velocity of rotation reaches the orbital value v sub c. (2) The second limit is defined by the magnetic field lines touching the cathode plate, which acts as a strong plasma sink. (3) At the third limiting surface the rotation velocity decreases to zero. (4) At the fourth limit the recombination processes become important and the plasma density decreases abruptly in the radial direction. Author (ESRO)

N74-26198# North Carolina State Univ., Raleigh. Dept. of Physics.
PRODUCTION, CONTROL AND ULTILIZATION OF EXTREMELY HIGH DENSITY RELATIVISTIC STREAMS Final Report
Willard H. Bennett 31 Dec. 1973 16 p refs
(Contract AF-AFOSR-1743-69)
(AD-776003; AFOSR-74-0351TR) Avail: NTIS CSCL 20/9

The project is concerned with the study of beam dynamics for electron beams above 10,000 amperes and above 1,000,000 volts, and primarily for beams above 100,000 amperes and above 10,000,000 volts. The objective is to develop methods for producing extremely intense pinch effects which will draw the beam down to diameters of the order of 1/10 millimeter. Methods have been developed for injecting the beam into already formed linear pinched discharges and these studies are continuing to include the use of tapered pinch discharges. (Modified author abstract) GRA

N74-26199# Wright State Univ., Dayton, Ohio.
REAL TIME LANGMUIR PROBE DATA REDUCTION BY A MINICOMPUTER FOR A COLLISIONLESS PLASMA Interim Report, Mar. 1972 - Mar. 1973
John C. Corbin, Jr., Justin A. Curtis, Dennis F. Growjean, Merrill L. Andrews, and John S. Martin Dec. 1973 110 p refs
(Contract F33615-69-C-1842; AF Proj. 7073)
(AD-776800; ARL-73-0114) Avail: NTIS CSCL 20/9

A real time Langmuir probe data reduction program was developed and applied to a mirror geometry electrodynamic magnetoplasma experiment (ELMAX). The total program requires less than one minute to determine the electron temperature, ion density, and plasma and floating potentials at one position in the plasma. (Modified author abstract) GRA

N74-26200# New York Univ., N.Y. Inst. of Mathematical Science.
MATHEMATICAL MODELS FOR PLASMAS Final Report
George Vahala and Michael Mock 1974 6 p refs
(Grant AF-AFOSR-2499-73; AF Proj. 9749)
(AD-776826; AFOSR-74-0323TR) Avail: NTIS CSCL 20/9

The paper presents studies of semi-conductors and of guiding center models. GRA

N74-26201# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE THEORY OF STREAMER BREAKDOWN
A. I. Zakharov, I. G. Iersyantsev, V. D. Pismennyi, A. V. Rodin, and A. N. Marosmin 11 Mar. 1974 22 p refs Transl. into ENGLISH from Zh. Prik. Mekhan. i Techn. Fiz. (Moscow), no. 1, 1973 p 56-65
(AD-776916; FTD-HT-23-702-74) Avail: NTIS CSCL 20/9

In the present study the authors developed a qualitative theory to calculate the velocity of an anode-directed streamer in a case where the latter is independent of length. The stability of a streamer front in relation to infinitely small excitations is studied. It is shown that when a front of finite thickness is considered the streamer is stable. In an approximation for an infinitely thin leading front, the streamer is unstable. GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-26202 Minnesota Univ., Minneapolis.
CRITICAL PHENOMENA IN SUPERCONDUCTORS Ph.D. Thesis
James Clark Solinsky 1973 218 p
Avail: Univ. Microfilms Order No. 74-10591

Experimental studies were carried out with 1000 A thick dirty granular aluminum films which were evaporated onto mica substrates. The electrical conductivity and heat capacity were studied in the superconducting transition region. The resistive transition of the film was used as a thermometer in conjunction with optical heating in an AC calorimetry scheme to measure the films 5 x 10 to the minus 9th power J/K heat capacity. Results presented on four films indicate a rise in the heat capacity near the low temperature region of the transition where the film's resistance becomes zero. This rise peaked in two films studied to a value of up to 20 times the BCS jump in heat capacity and at a temperature of about 20 mK below the MFT transition temperature as determined from the conductivity measurements. An applied magnetic field widened and reduced the peak in the heat capacity while shafting it to a lower temperature. Dissert. Abstr.

N74-26203# Minnesota Univ., Minneapolis.
NOISE ON SUPERCONDUCTOR DEVICES Ph. D. Thesis
Hyun Mook Choe 1973 219 p
Avail: Univ. Microfilms Order No. 74-10495

Flux-flow noise in Type 2 superconductors like vanadium foil was studied theoretically and experimentally. The noise spectra of a superconductor foil with finite dimensions were studied and evaluated by aid of a digital computer, looking at the behavior of single fluxoid motion. This part can also explain the steep drop at high frequencies in the flux-flow noise spectrum due to a probe size effect. Flux-flow noise and other properties of Type 2 superconductors were measured in the temperature range of from 4.2 K to 1.8 K and compared with theory and a reasonable agreement was noted. Induced flux-flow noise was also studied theoretically and experimentally with the help of pick-up wires separated from the Type 2 superconducting foil by a thin insulating layer. The induced flux-flow noise in the pick-up wires was very small. A Josephson junction amplifier working at cryogenic temperatures based on the Josephson effects was studied and a prototype amplifier at 30 MHz carrier frequency was made. Dissert. Abstr.

N74-26204 Ohio State Univ., Columbus.
IMPURITY ANALYSIS OF EPITAXIAL GALLIUM ARSENIDE WITH AN ACCURATE HALL EFFECT APPARATUS Ph.D. Thesis
Mark Edward Davis 1973 147 p
Avail: Univ. Microfilms Order No. 74-10942

Ultra high purity epitaxial gallium arsenide grown by both liquid and vapor expitaxy is studied in the temperature range of ionized impurity scattering. A Hall effect apparatus is described that allows an accurate determination of the galvanomagnetic coefficients at constant temperature points in the range 4.2K - 50K. By a careful analysis of the temperature dependence of the Hall coefficient in this region the donor densities and activation energies of four distinctly different samples are obtained. Because of the accuracy of the data, it is possible to deduce the contribution to conduction from two separate donor species in at least one of the samples; thereby establishing the usefulness of this technique in materials analysis. A careful study of the magnetic field dependence of the galvanomagnetic coefficients was made in order to evaluate the validity of making an impurity analysis from Hall data at fixed magnetic field. Dissert. Abstr.

N74-26205# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SHUBNIKOV-DE HAAS EFFECT AND BAND STRUCTURE INVESTIGATIONS IN BISMUTH-ANTIMONY ALLOYS
D. Schneider Jan. 1973 56 p refs Transl. into ENGLISH from Z. Naturforsch. (Tuebingen), v. 27a, no. 2, 1972 p 250-270
(NTC-74-11906; Rept-73-38) Avail: NTIS HC $6.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Magnetoresistance, Hall effect and susceptibility were investigated in Te-doped BiSb single crystals. The experimental results establish the occurrence of both longitudinal and transverse SdH-oscillations over a wide temperature range up to T = 77 K. Single temperatures, cyclotron masses, spin splitting and the effective mass tensor of the electrons at the Fermi level and the band edge were calculated from the temperature and angular dependence of the SdH oscillations. The results are discussed with respect to various models of the electron band structure. The behavior of the small Fermi surface cross-sections is in agreement with the ENP model. However, a slight variation of the effective mass must be assumed in the long direction of the quasi-ellipsoids. Author

N74-26206# Lincoln Lab., Mass. Inst. of Tech., Lexington.
NEW FLUOROPEROVSKITES WITH Cr-III AND Mn-III: A(B SUB 0.5Cr SUB 0.5)F SUB 3 AND A(B SUB 0.5Mn SUB 0.5)F SUB 3; A,B EQUALS ALKALI METAL
G. Siebert and R. Hoppe Jan. 1973 11 p refs Transl. into ENGLISH from Z. Anorg. Allgem. Chem. (Leipzig), v. 391, no. 2, 1972 p 117-124
(NTC-74-11924; Rept-73-37) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The use of the Guinier technique to prepare green type Cs2KCrF6, Rb2KCrF6, Rb2NaCrF6, and Cs2NaCrF6, as well as violet Rb2NaMnF6, Rb2KMnF6, and Cs2NaMn6 was examined. Also examined was the Jahn-Teller effect and lattice energy of Rb2NaMnF6 and K2NaMnF6. Author

N74-26207# Lincoln Lab., Mass. Inst. of Tech., Lexington.
BACKSCATTERING OF MEDIUM-FAST ELECTRONS BY THIN FOILS
H. Niedrig and P. Sieber Feb. 1973 13 p refs Transl. into ENGLISH from Z. Angew. Phys. (Berlin), v. 31, no. 1, 1971 p 27-31
(NTC-74-11856) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The electron backscattering of thin (200-13000 A) metal foils has been investigated for various metals and energies (20-53 keV). The total backscattered intensity is proportional to the foil thickness within a large range of thicknesses and is somewhat larger than the theoretical prediction using the Rutherford cross-section. Furthermore, it is nearly independent of crystal orientation, foil temperature and small holes in the foil. Therefore, the backscattered intensity is a good measure for the film thickness. This method has been used advantageously to determine the thickness of electron microscopic specimens inside the electron microscope. Author

N74-26208# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THERMAL ANALYSIS OF THE CdGe(Ae(As(x)P(1-x))2
Z. H. Borisova, N. A. Goyunova et al Jun. 1973 5 p refs Transl. into ENGLISH from Vestn. Leningr. Univ., Ser. Fiz. i Khim. (Leningrad), no. 1(4), 1970 p 165-167
(NTC-74-11866; Rept-73-152) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The electrical and physico-chemical properties of semiconductor materials are discussed. Thermo-physical data were obtained for cadmium-germanium-arsenide (CdGeAs2) and cadmium-germanium-phosphide (CdGeP2). It was determijend that the densities of crystalline CdGeAs2 and CdGeP2 are lower than those of the glass form. The softening point and crystallization point increase in the transition from CdGeAs2 to CdGeP2. The density was determined by the hydrostatic suspension of the samples in toluol. Data obtained from an analysis of thermograms are presented in tabular form. Author

N74-26209# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOME PROPERTIES OF Cd(x)Hg(1-x)Te FILMS
K. V. Kolezhuk and G. A. Fedorus Jun. 1973 5 p refs Transl. into ENGLISH from Poluprov. Tekh. Mikroelektron. Akad. Nauk Vkr. SSR, (Kiev), no. 9, 1972 p 18-20
(NTC-74-11865; Rept-73-151) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The Cd(x)Hg(1 - x)Te films were obtained by the instantaneous (explosive) thermal vaporization of a monocrystalline powder in a vacuum on the order of 0.00001 mm Hg on backings of glass, mica, quartz, KBr, and BaF2, heated to 60-300 C. The temperature of the vaporizer was 900-950 C, the precipitation rate was 50-70 A/min, and the thickness of the films was 5,000-10,000 A. Data are presented on the electrical conductivity of the films as a function of the temperature of the backing, and as a function of the mean size of the grains of the vaporized material; the transmission minima of the films as a function of the wavelength of the incident radiation; and the temperature function of the Hall coefficient and electrical conductivity in the temperature interval 100-380 K. Author

N74-26210# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SECONDARY EMISSION PROPERTIES OF MAGNESIUM OXIDE FILMS OBTAINED BY MEANS OF ELECTRON BEAMS
V. L. Borisov and I. Ya. Shapiro Jan. 1973 10 p refs Transl. into ENGLISH from Tr. Leningr. Politekh. Inst. (Leningrad), no. 311, 1970 p 20-24
(NTC-74-11922; Rept-73-48) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Results from the investigation of secondary emission characteristics of magnesium oxide layers, prepared by means of an electron beam are presented. Also given are results from a comparison of samples prepared by other methods. Author

N74-26211# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE INTERACTION OF ELECTROLUMINESCENCE AND PHOTOCONDUCTIVITY DURING SWITCHING IN ZnCdS-Cu, Mn CRYSTALLOPHOSPHORS
A. G. Goldman and A. I. Proskura Apr. 1973 10 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 17, no. 7, 1972 p 1148-1152
(NTC-74-11905; Rept-73-112) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Powder crystallophosphors ZnCdS-Cu, Mn conductivity during electroluminescence is reviewed. Effect of electroluminescence emission is presented. Electroluminescence ignition, spectral characteristics of switching, temperature quenching of increased conductivity and its kinetics are studied. A conclusion is substantiated on maintenance of the increased conductivity due to establishing positive feedback between electroluminescence brightness and self-induced photocurrent. Author

N74-26212# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOME PROPERTIES OF SOLID STATE CdSnAs2-A2B6 (CdSe, CdTe) SOLID STATE SOLUTIONS
Ch. Dovletmuradov and S. N. Krzhivitskaya May 1973 6 p Transl. into ENGLISH from Izv. Akad. Nauk Turkm. SSR, Ser. Fiz.-Tekh. Khim. i Geol. Nauk (Ashkaabad), no. 5, 1971 p 111-112
(NTC-74-11863; Rept-73-125) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago Ill. 60616

The formation of solid solutions of CdSnAs2 - 2CdSe and CdSnAs2 - 2CdTe is investigated. Physaio-chemical and electric properties of the solutions have been investigated (Hall effect and specific conductivity) in the temperature interval 80-680 K. Author

N74-26213# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON SLOW AND FAST STATES ON A SEMICONDUCTOR SURFACE
F. F. Volkenshtein, I. V. Karpenko et al Feb. 1973 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Fiz. Khim.), v. 206, no. 1, 1972 p 136-139
(NTC-74-11897; Rept-73-102) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The basic electron characteristics which determine the relaxation time for electron surface states on semiconductor surfaces are explained. In order to estimate the probability for the electron transitions between the conduction zone and the deep surface electron levels in the forbidden zone, results from the theory of multi-phonon transitions was used. Special attention was given to the electron transitions in the Condon approximations. Author

N74-26214# Northrop Corp., Hawthorne, Calif.
RADIATION EFFECTS ON SEMICONDUCTOR MATERIALS AND DEVICES Final Report, May - Nov. 1973
J. R. Srour, O. L. Curtis, Jr., S. Othmer, K. Y. Chiu, and V. D. Deokar Dec. 1973 280 p refs
(Contract DAAG39-73-C-0171)
(AD-776420; NRTC-73-46R; HDL-TR-171-4) Avail: NTIS CSCL 20/12

Contents: Analytical studies, Recombination in irradiated silicon, Charge transport in silicon dioxide, ionizing radiation effects on MOS devices, and Measurement of drift mobility in low-lifetime silicon. GRA

N74-26215# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FIELD-STRENGTH CONDITIONS FOR THE MEASUREMENT OF CARRIER LIFETIMES IN SEMICONDUCTOR CRYSTALS BY THE LIGHT-FLASH METHOD
H. Benda and F. Dannhauser Feb. 1973 26 p refs Transl. into ENGLISH from Siemens Forsch.-und Entwicklungsberichte, v. 1, no. 3, 1972 p 255-262
(NTC-74-11876; Rept-73-68) Avail: NTIS HC $4.50; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The lifetime of the mobile charge carriers of a semiconducting crystal is determined insofar as it is dependent on volume recombination. The light flash method is described and its limitations noted. The basis and physical meaning of the Stevenson-Keyes condition is discussed. A circuit diagram of the light flash method is included. A.A.D.

N74-26216# Lincoln Lab., Mass. Inst. of Tech., Lexington.
STUDY OF THE A.C. ELECTRICAL RESISTANCE OF THIN FILMS OF Pt-SiO CERMET WITH LOW METAL CONTENT
J. Pinguet and S. S. Minn Feb. 1973 6 p refs Transl. into ENGLISH from Compt. Rend. Acad. Sci Paris (B)(Paris), v. 275, no. 8, 1972 p 287-290
(NTC-74-11893; Rept-73-74) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Measurements of the dielectric constant of platinum-silicon oxide cermets as a function of temperature for different frequencies and platinum contents were conducted. Graphs are provided to show the relationship between frequency and platinum content and capacity as a function of temperature. The effect on the capacity produced by a direct current voltage superposed on the alternating field was also investigated. It was found that the conductivity decreases as the direct current voltage increases. Author

N74-26217# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPITAXIAL GROWTH OF LEAD TELLURIDE ON CADMIUM TELLURIDE IN THE LIQUID PHASE
L. Mayet, M. Gavand et al Feb. 1973 4 p refs Transl. into ENGLISH from Compt. Rend. Acad. Sci. Ser. B (Paris), v. 275, no. 20, 1972 p 751-753
(NTC-74-11890; Rept-73-76) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The growth of epitaxial films of lead telluride in solution from a mixture of lead and tellurium was achieved on substrates of lead telluride. Monocrystalline deposits of this same compound were obtained on substrates of cadmium telluride, particularly for determining the conditions of growth and the electrical and optical properties of these heterojunctions. Because of the small difference of their unit cells it appears that the association of two semiconductors is possible. Author

N74-26218# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CHANGES IN PHOTOELECTRIC PROPERTIES OF CdSe EVAPORATED FILM DURING ACTIVATION
S. V. Svechnikov, V. G. Chalaya et al Mar. 1973 8 p refs Transl. into ENGLISH Ukr. Fiz. Zh. (Kiev), v. 17, no. 1, 1972 p 106-109
(NTC-74-11904; Rept-73-94) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

CdSe films and the changes that take place during activation were investigated. Conductivity, photosensitivity, its temperature dependence and distribution of local levels in the forbidden band were measured. Author

N74-26219# Defence Research Information Centre, Orpington (England).
MINORITY CARRIER DIFFUSION LENGTHS IN GaAs EPITAXIAL LAYERS. COMPARISON OF VARIOUS METHODS OF MEASUREMENT
U. Langmann Jan. 1974 12 p refs Transl. into ENGLISH from Solid State Electron. (Oxford), v. 16, no. 9, Sep. 1973 p 12-15 Sponsored by Landesamt fuer Forsch. Des Landes Nordrhein-Westfalen
(DRIC-Trans-3455; BR30728) Avail: NTIS HC $4.00

Minority carrier diffusion lengths are measured on lightly n-doped epitaxial layers. Three different methods of measurement were compared. These operate with photoluminescence, surface photo effect, and pulsed MIS-capacitance. In the photoluminescence measurements, the influence of a surface depletion layer is considered. The results of measurements show no dependence of the diffusion lengths on the majority carrier concentration. The measured absolute values, on the other hand, depend clearly on the method of measurement used. Author (ESRO)

N74-26220# Defence Research Information Centre, Orpington (England).
DIELECTRIC PROPERTIES OF SOME OXIDES OF COMPOSITION Ba(1-y)Sr(y)FeO(3-x) AND Ba(1-y)Sr(y)Fe(1-z)M(z)O (2.5) (M = Ga OR In)
C. Gleitzer and X. Gerbaux Sep. 1973 17 p refs Transl. into ENGLISH from J. Chim. Phys., v. 70, no. 2, Feb. 1973 p 276-281
(DRIC-Trans-3282; BR30609) Avail: NTIS HC $4.00

Two quadratic perovskites, semiconducting oxides containing Fe(3+) and Fe(4+), were studied in terms of temperature and frequency; Ba(1-y)Sr(y)FeO(3-x) shows considerable dielectric constants and high loss-angles. On the other hand, two insulating oxides, Ba(1-y)Sr(y)Fe(1-z)M(2)O(2.5) (M = Ga or In) cubic perovskites free from Fe(4+), have much weaker dielectric constants with a loss-angle which may be relatively small. All the perovskites studied are transparent in the far infrared from 10 to 40/cm where a wide absorption band begins which extends towards the high frequencies. Evidence of pyroelectricity is also described. Author (ESRO)

N74-26221# Texas Univ., Austin. Dept. of Physics.
ENERGY BAND FOR THE (001) SURFACE OF ALUMINUM
Ed Caruthers 30 May 1973 10 p refs Repr. from Phys. Rev., B, v. 8, no. 10, 15 Nov. 1973 p 4570-4577
(Grants AF-AFOSR-2308-72; NSF GH-40371)
(AD-775182/9; AFOSR-74-0218TR) Avail: NTIS CSCL 20/12

An energy-band calculation has been performed on a 13-layer film of (001) aluminum. Surface states are found in Gamma, M, and X in the two-dimensional Brillouin zone, and along the lines connecting these points. Wave functions are plotted and decay constants tabulated for some of these surface states. The charge density in the (001) direction has also been plotted for various positions in the planar unit cell, and for an average over the unit cell. Finally, the 13-layer energy bands are compared to a (001) projection of the three-dimensional energy bands, and effects of film thickness as well as the surface perturbation are shown. Author (GRA)

N74-26222# Colorado State Univ., Fort Collins.
ELECTRONICS OF COMPOUND SEMICONDUCTOR INTERFACES: SUMMARY OF WORKSHOP CONFERENCE
James R. Sites, ed. and Carl W. Wilmsen, ed. 1 Mar. 1974 86 p refs Conf. held at Fort Collins, Colo., 5-6 Feb. 1974 Sponsored in part by AROD
(Contract N00014-67-A-0299-0017; NR Proj. 372-305)
(AD-776262; SF2) Avail: NTIS CSCL 20/12

The document contains the summaries of the formal presentations made at the Electronics of Compound Semiconductor Interfaces workshop conference held February 5-6, 1974, at Colorado State University. The purpose of the workshop conference was to learn what progress is being made in understanding the boundaries of compound semiconductors and the significant effects these interfaces have on the operation, reliability, and stability of electronic devices. Various participants reported on the behavior of free semiconductor surfaces, semiconductor-metal, semiconductor-insulator, and semiconductor-semiconductor interfaces. For the most part the discussions dealt with compound semiconductors with particular emphasis on III-V materials. GRA

N74-26223# Columbia Univ., New York. Dept. of Civil Engineering and Engineering Mechanics.
EQUATIONS OF HIGH FREQUENCY VIBRATIONS OF THERMOPIEZOELECTRIC CRYSTAL PLATES
R. D. Mindlin Nov. 1973 31 p refs
(Contract N00014-67-A-0108-0027; NR Proj. 064-388)
(AD-775654; TR-27) Avail: NTIS CSCL 09/1

A system of two-dimensional equations is derived for high frequency motions of crystal plates accounting for coupling of mechanical, electrical and thermal fields. Author (GRA)

N74-26224# Manitoba Univ., Winnipeg. Dept. of Physics.
AN INVESTIGATION OF THE DYNAMIC SUSCEPTIBILITY OF Nd(1-x)Sm(x)Co5 SINGLE CRYSTALS AND THE EFFECT OF HYDROGEN ABSORPTION Final Technical Report, 15 Feb. - 14 Aug. 1973
I. Maartense Oct. 1973 50 p refs
(Contract F33615-73-C-5060)
(AD-775717; AFML-TR-73-250) Avail: NTIS CSCL 20/12

Measurements are reported on the ac susceptibility of Nd sub (1-x)SmCo5 single crystals, with x = 0, 0.25, 0.5, 0.75 and 1.0. The spin reorientation temperature, which occurs at 281 K in NdCo5, is found to occur at 167 K and approximately 140 K in the alloys with x = 0.25 and 0.5. Small quantities of absorbed hydrogen raise these temperatures by a few degrees. When a swept biasing field is reversed, the presence of an internal critical field is noted as well as rate dependent losses which cause as apparent drop in the susceptibility. The presence of hydrogen causes a boubling of this field as well as an increase in the losses, which are associated with strong Barkhausen discontinuities. In NdCo5 a strong hydrogen induced relaxation characterized by an activation energy of 0.4 eV is seen below 220 K. Additional relaxations occur near 375 K and 720 K. Author

N74-26225# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SUBMILLIMETER SPECTROSCOPY OF SEMICONDUCTORS
E. M. Gershenzon, G. N. Goltsman, and N. G. Ptitsina 22 Feb. 1974 27 p refs Transl. into ENGLISH from Zh. Eksperium. Teor. Fiz. (Moscow), v. 64, no. 2, 1973 p 587-598
(AD-776116; FTD-HT-23-754-74) Avail: NTIS CSCL 20/12

Possibilities are considered for carrying out studies of semiconductors on submillimeter waves, using a high-resolution spectrum based on back-wave tubes. The results of the study carried out on the spectra of excited states of minute impurities, D(-)(A(+))-centers and free excitons in germanium are presented. GRA

N74-26226# Army Foreign Science and Technology Center, Charlottesville, Va.
ENERGY AND VOLUME CHANGES IN A CRYATAL CONTAINING DISLOCATIONS
Yu. V. Kornyushin 26 Dec. 1973 7 p refs Transl. into ENGLISH from Metallofiz. (USSR), no. 30, 1970 p 34-37
(AD-776129; FSTC-HT-23-2257-72) Avail: NTIS CSCL 20/12

Energy and volume change in crystals containing dislocations are analytically determined by considering the type and distribution of dislocations. The influence of various factors on the accuracy of analytical results is discussed. GRA

N74-26227# California Univ., Los Angeles. Dept. of Chemistry.
PHOSPHORESCENCE MICROWAVE PHOTOEXCITATION SPECTROSCOPY: A NEW TECHNIQUE FOR THE STUDY OF ENERGY TRANSFER IN MOLECULAR CRYSTALS
A. K. Wilkerson, J. B. Chodak, and M. A. El-Sayed Mar. 1974 20 p refs
(Contract N00014-69-A-0200-4012; NR Proj. 056-498)
(AD-776266; TR-17; Contrib-3257) Avail: NTIS CSCL 07/4

Conventional photoexcitation spectroscopy is supplemented with phosphorescence microwave double resonance techniques to produce a method for studying the mechanisms of energy transfer processes in molecular crystals. The results clearly show that in doped mixed crystals of limited guest-in-host solubility, triplet-triplet energy transfer is more important than singlet-singlet energy transfer in pumping the lowest triplet state of the guest molecule when the singlet state of the host is excited. Author (GRA)

N74-26228# Notre Dame Univ., Ind. Dept. of Metallurgical Engineering and Materials Science.
STRUCTURE OF GRAIN BOUNDARIES IN OXIDES Final Report
G. C. Kuczynski Dec. 1973 91 p refs
(Contract F33615-69-C-1784; AF Proj. 7021)
(AD-776069; ARL-73-0185) Avail: NTIS CSCL 20/12

The magnetic properties of sintered alpha-ferric oxide were investigated as a function of grain size for three different kinds of powders. The coercive force was found to change drastically as soon as grain boundaries were formed by sintering, while the Morin temperature and the antiferromagnetic susceptibility were unaffected. The increase of magnetic hardness was identified as an effect of grain boundaries rather than the effect of crystal size only. The existence of grain boundaries appeared to be equivalent to the existence of strong uniaxial anisotropy of the order of 1000 ergs per g in the vicinity of grain boundary which could be visualized as a film possessing strong uniaxial anisotropy. The microscopic origin of the strong uniaxial anisotropy associated with grain boundaries is discussed on the basis of the dislocation structure of the grain boundary. The lowering of six fold symmetry of the crystal to two fold symmetry due to dislocations is suggested as the origin of this uniaxiality. (Modified author abstract) GRA

N74-26229# Army Foreign Science and Technology Center, Charlottesville, Va.
THE ACTION OF LIGHT ON A COLORED RUBY
G. E. Arkhangelskii, Z. L. Morganshtern, and V. B. Neustruev 23 Oct. 1973 13 p refs Transl. into ENGLISH from "Spektroskopiya Kristallov, Simpoziuma po Spekroskopii Kristalov,

Soderzhashchikh Redkozemelnye Elementy Gruppy Zheleza, (2d), Kharkov, Oct. 1964" Moscow, Materialy, 1970 p 273-280
(AD-776098; FSTC-HT-23-153-73) Avail: NTIS CSCL 20/6

Investigations are described which determined that the principle color centers, colored by both optical and hard radiations are Cr(2+) and Cr(4+) ions. GRA

N74-26230# Harry Diamond Labs., Washington, D.C.
ANALYSIS OF THE GROUND CONFIGURATION OF TRIVALENT THULIUM IN SINGLE-CRYSTAL YTTRIUM VANADATE
Donald E. Wortman, Richard P. Leavitt, and Clyde A. Morrison Dec. 1973 19 p refs
(DA Proj. 1T0-61102-A-31C)
(AD-776343; HDL-TR-1653) Avail: NTIS CSCL 07/4

An analysis has been made of the optical spectrum of Tm(3+) in YVO4. The approach taken was to describe the Tm(3+) free-ion energy levels as completely as possible and then to describe the effects of the crystal field on these levels. The results gave a new interpretation of the triplet H4 and triplet H5 multiplets and gave g factors in good agreement with the measurements. The effects of the hyperfine interaction and the spin-crystal-field interaction on the energy levels are discussed. (Modified author abstract) GRA

N74-26231# Boeing Co., Seattle, Wash.
THE STRUCTURE OF NON-CRYSTALLINE MATERIALS Final Report, 4 Feb. 1971 - 31 Dec. 1973
Farrel W. Lytle 31 Dec. 1973 62 p refs
(Contract DAHC04-71-C-0010; ARPA Order 1562)
(AD-776413; AROD-9209-8-P) Avail: NTIS CSCL 20/2

The primary purpose of this research was to develop the phenomenon of extended X-ray absorption fine structure (EXAFS) as a technique for investigating the structure of non-crystalline materials, particularly amorphous semiconductors. GRA

N74-26232# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.
SUPERCONDUCTING THIN FLIMS IN THE NIOBIUM-VANADIUM AND TITANIUM-TANTALUM SYSTEMS Technical Report, Jul. 1972 - Jul. 1973
Hermann J. Spitzer Feb. 1974 12 p refs
(DA Proj. 1T1-61102-A-34A)
(AD-776949; USAMERDC-2088) Avail: NTIS CSCL 20/12

Thin films of Nb-V and Ti-Ta alloys have been deposited by DC co-sputtering onto fused quartz at substrate temperatures of 700C. Deposition rates averaged 100A per minute and the thickness of all samples was of the order of 3000A. Jc-H characteristics were measured by a pulsed field-pulsed current technique and Tc's by monitoring the electrical resistance with temperature. Tc's in the Ti-Ta system are generally lower than in bulk, but considerably higher in the Nb-V system. The Jc's in both systems are comparatively high at low fields, but fall off rapidly with increasing magnetic fields. Author (GRA)

N74-26233# Michigan Univ., Ann Arbor. Electron Physics Lab.
DETERMINATION OF CURRENT VERSUS ELECTRIC CHARACTERISTICS IN MULTIVALLEY SEMICONDUCTORS Interim Technical Report, 1 Aug. - 1 Nov. 1973
E. H. Sigman 1 Nov. 1973 215 p refs
(Contract F30602-71-C-0099; AF Proj. 5573)
(AD-776806; TR-129; RADC-TR-73-401) Avail: NTIS CSCL 20/12

A computer simulation of the dc transport characteristics for both isotropic and anisotropic semiconductors of any arbitrary band structure is developed. A distinct drifted Maxwell-Boltzmann distribution is used for each band. The zeroth, first and second moments of the Boltzmann equation are used to calculate the electron density, velocity and temperature in each of the conduction bands for an applied electric field of any arbitrary orientation. Acoustic phonon, optical phonon and polar optical phonon scattering are included in the analysis. A computer subroutine which calculates the collision integral due to phonon scattering by using numerical integration is developed and a solution scheme for the current vs. electric field characteristics which uses this subroutine is presented. The computer program is used to determine the current vs. electric field characteristics for n-Ge for given electric field orientations. (Modified author abstract) GRA

N74-26234# Rensselaer Polytechnic Inst., Troy, N.Y. Mechanics Div.
SECOND HARMONIC GENERATION AND PARAMETRIC EXCITATION OF SURFACE WAVES IN ELASTIC AND PIEZOELECTRIC SOLIDS
H. F. Tiersten and J. C. Baumhauer Mar. 1974 61 p refs
(Contract N00014-67-A-0117-0007; NR Proj. 017-504)
(AD-777017; TR-9) Avail: NTIS CSCL 20/2

Nonlinear electroelastic equations, quadratic in the small field variables, are applied in the analysis of second harmonic generation of surface waves in piezoelectric solids. Preliminary to the treatment of the anisotropic piezoelectric case, the more tractable problems of the second harmonic generation and parametric excitation of surface waves in isotropic elastic solids are treated. In all instances the solutions asymptotically satisfy the nonlinear differential equations and boundary conditions on the surface of the semi-infinite solid to a specified order in a small parameter. Since the equations are quadratic, rather than cubic, in the small field variables, only the initial spatial rates of growth of the harmonically generated and parametrically excited waves are determined. Nevertheless, an extension of the analysis to enable the calculation of more than the aforementioned initial slopes is indicated. In the isotropic elastic case the solution for the second harmonic reveals, among other things, that the ratio of the dilatational to equivoluminal portions of the growing second harmonic is the same as in the input Rayleigh wave. Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-26235 Utah Univ., Salt Lake City.
EXTINGUISHMENT OF COMPOSITE PROPELLANT COMBUSTION AT LOW PRESSURES Ph.D. Thesis
Chung Poo Park 1973 347 p
Avail: Univ. Microfilms Order No. 74-9630

A study was made of the extinguishment of composite solid propellant strands at low pressures. Both the extinguishment at a constant pressure near the low pressure deflagration limit and the extinguishment during depressurization were considered. The effects of the depressurization rate, the supplemental heat flux, and the propellant chemistry on the extinguishment were investigated. Controlled thermal environments were produced inside a large-volume combustion chamber by a quick-heating nichromeribbon furnace or by a cooling coil. The steady-state and transient burning rates were determined by continuously measuring the weight of the strands. Two distinct extinguishment regimes were observed for the extinguishment during depressurization, signifying two different extinguishment mechanisms. Dissert. Abstr.

N74-26236*# TRW Systems Group, Redondo Beach, Calif.
STUDY OF MONOPROPELLANTS FOR ELECTROTHERMAL THRUSTERS: DESIGN AND FABRICATION TASK SUMMARY REPORT Interim Report, May - Jul. 1973
J. D. Kuenzly Jan. 1974 26 p refs
(Contract NAS5-23202)
(NASA-CR-139617; TRW-22409-6012-RU-00) Avail: NTIS HC $4.50 CSCL 21A

The feasibility of operating small thrust level electrothermal thrusters with monopropellants other than MIL-grade hydrazine was studied. Analytical study, design, and fabrication of demonstration thrusters was performed, and an evaluation test program was initiated to evaluate monopropellants with freezing points lower than MIL-grade hydrazine, and to determine their applicability to electrothermal thrusters for spacecraft attitude control. Five demonstration thrusters were fabricated to determine the feasibility of operation with monomethylhydrazine, Aerozine-50, 77 percent hydrazine-23 percent hydrazine azide.

and a mixture of hydrazine monopropellants consisting of 35 percent hydrazine-50 percent monomethylhydrazine-15 percent ammonia. The present thruster is designed to produce a steady-state thrust level of 0.344 N at 1.724 x 1 million N/M sq feed pressure. Vacuum specific impulse goals were set at 1961 N-s/kg steady-state and 1716 N-s/kg pulsed-mode.
Author

N74-26237*# General Dynamics/Convair, San Diego, Calif.
AN ANALYTICAL STUDY OF REDUCED-GRAVITY PROPELLANT SETTLING
Robert D. Bradshaw and James L. Kramer Feb. 1974 58 p refs
(Contract NAS3-16772)
(NASA-CR-134593; CASD-NAS-74-005) Avail: NTIS HC $6.00 CSCL 21I

A study was performed to define full-scale propellant reorientation flow dynamics for the D-1T Centaur fuel tank. A computer code using the Simplified Marker and Cell technique was modified to include the capability for a variable grid mesh configuration. The use of smaller cells near the boundary, near baffles and in corners provides improved flow resolution. The new program, structured in overlay, is more efficient in core usage and is suitable for larger size problems. Three Lewis Research Center drop tower model cases were simulated to verify program validity, two cases without baffles and one case with baffles and geometry identical to D-1T Centaur. Flow phenomena using the new code successfully modeled drop tower data. Flow trajectories off the baffles exhibited dependence on initial fluid location in relation to the baffle and on initial flow velocity. Two fullscale D-1T Centaur cases were then simulated using parameters based on the Centaur D-1T Proof Flight.
Author

N74-26238# Technological Lab. RVO-TNO, Rijswijk (Netherlands).
INVESTIGATION INTO THE COMPATIBILITY OF EXPLOSIVES IN MUTUAL CONTACT AND/OR IN CONTACT WITH NON-EXPLOSIVES. PART 1: COMPATIBILITY OF PROPELLANTS WITH POLYMERS
A. Leutscher and H. Stam 14 Dec. 1973 34 p refs
(TL-1973-29; TDCK-63416) Avail: NTIS HC $4.75

Short duration test methods have been selected to forecast as reliably as possible the compatibility of propellants and polymers during prolonged storage periods. The propellants and polymers were aged in contact with each other for 40 h at 100 C (accelerated aging experiments), and for 3,6 and 12 months at 40 C (long term aging experiments). Before and after the aging period the chemical composition and the caloric value of the propellant, and the tensile impact energy of the polymer were measured. The vacuum stability test and the isothermal heat generation meter were used to detect the increase in gas evolution, respectively the increase in heat generation due to possible reactions between propellant and polymer. Author (ESRO)

N74-26239# Bonner and Moore Associates, Inc., Houston, Tex.
PROJECTED AVAILABILITY OF MOTOR GASOLINE AND DISTILLATE FUELS, 1975 - 1985 Final Report
15 Jan. 1974 108 p
(Contract DAAD05-73-C-0558; DA Proj. 1T6-62611-A-106)
(AD-775859; RGH-042) Avail: NTIS CSCL 21/4

The project involved the preparation of forecasts for raw materials availability and product demands for the U.S. refining industry through 1985 and the construction of a mathematical model of the industry. The major objective was to conduct an economic projection of the availability and compositional trends for automotive gasolines and distillate fuels during the next decade. Four major product demand forecasts (scenarios) were prepared and used to examine the industry. Additionally, the availabilities of jet and diesel fuels were examined in 1985 under two alternate premises. Author (GRA)

N74-26240# Monsanto Research Corp., Dayton, Ohio.
ENVIRONMENTAL DEGRADATION OF FUELS, FLUIDS, AND RELATED MATERIALS FOR AIRCRAFT. VOLUME 1: GENERAL STUDIES Final Report, 1 Dec. 1971 - 30 Nov. 1973
F. Neil Hodgson, William G. Scribner, and A. Melvin Kemmer Mar. 1974 94 p refs
(Contract F33615-72-C-1071; AF Proj. 3048)
(AD-776802; MRC-DA-414-Vol-1; AFAPL-TR-74-8-Vol-1) Avail: NTIS CSCL 21/4

Research on a variety of hydrocarbon fuel properties and fuel additives is described. Studies concerning depletion of fuel system icing inhibitor from fuel upon storage and possible loss of lubricity additive upon exposure of fuels to water are discussed. Causes of fuel tank foam deterioration have been investigated and are described. Presented, also, are results from studies of the compatibility of certain fuel system materials with hydrocarbon fuels. Data are presented on high density fuels and fuel blends for which dielectric constants were measured as a function of temperature and on which low temperature behavior studies were conducted. The synthesis of the dimer of 7-methylnorbornadiene for evaluation as a high density fuel is described in detail. (Modified author abstract) GRA

N74-26241# Monsanto Research Corp., Dayton, Ohio.
ENVIRONMENTAL DEGRADATION OF FUELS, FLUIDS, AND RELATED MATERIALS FOR AIRCRAFT. VOLUME 2: CLAY FILTRATION OF JP-7 AND JP-TS FUELS TO IMPROVE THERMAL STABILITY Final Report, 1 Dec. 1971 - 30 Nov. 1973
F. Neil Hodgson, A. Melvin Kemmer, William G. Scribner, and James R. McCoy Mar. 1974 49 p refs
(Contract F33615-72-C-1071; AF Proj. 3048)
(AD-776803; MRC-DA-414-Vol-2; AFAPL-TR-74-8-Vol-2) Avail: NTIS CSCL 21/4

An investigation of the effectiveness of filtering MIL-T-25524, Grade JP-TS and MIL-T-38219, Grade JP-7 fuels through attapulgus clay in order to improve thermal stability is described. A test apparatus was constructed on which drum quantities of the fuels could be filtered through a single cartridge containing approximately 15 pounds of clay. The removal of contaminants, added metals, and desired additives was studied. Experiments showed that 400-500 gallons of fuel could be filtered through a single cartridge, depending upon the type of contaminant. It is significant that, though saturated with respect to one or more components, the clay continued to remove low levels of polar metal compounds from the fuel. Recommendations for scale-up of the laboratory unit to a portable field unit were made. (Modified author abstract) GRA

N74-26242# Air Force Weapons Lab., Kirtland AFB, N.Mex.
AVIATION FUEL SPILL CONTAINMENT USING ABSORBENT MATERIALS Final Report, Aug. - Dec. 1973
Eugene E. Mazewski and Ronald H. Kroop Mar. 1974 32 p
(AF Proj. 683L)
(AD-776762; AFWL-TR-74-9) Avail: NTIS CSCL 21/4

An evaluation on using absorbent materials to control aviation fuel spills was conducted. A literature search was made to determine what materials would be applicable. Three materials were chosen. Evaluations were made on a laboratory scale, a slightly expanded scale on actual pavement, and a gull-scale field demonstration under controlled conditions. It was determined that only one of the materials was feasible for the rapid containment of small (10 to 100 gallon) fuel spills. It is recommended that a full-scale evaluation of this product be conducted at an Air Force base. Author (GRA)

N74-26243# Naval Civil Engineering Lab., Port Hueneme, Calif.
SUBSTITUTION OF JP-5 AVIATION FUEL FOR DF-2 DIESEL UNDER FIELD CONDITIONS
John S. Williams Feb. 1974 10 p refs
(AD-777047; NCEL-TN-1333) Avail: NTIS CSCL 21/4

The report covers the work done to determine whether JP-5 aviation turbine fuel is a suitable substitute for DF-2 diesel fuel in the heavy equipment of the Naval Construction Force wodn such equipment is deployed on a large construction project. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-26244 California Inst. of Tech., Pasadena. Environmental Quality Lab.
COST AND PERFORMANCE OF AUTOMOTIVE EMISSION CONTROL TECHNOLOGIES
Glen R. Cass Dec. 1973 32 p refs
(Grant NSF GI-29726)
(EQL-Memo-7) Copyright. Avail: Issuing Activity

The near-term commercial feasibility of a wide range of automotive emission control technologies was investigated. Manufacturability and costs associated with each emission control technology are considered. Principle control techniques are listed along with fuel economy, price, maintenance cost, and emissions data for subcompact vehicles identified by the model year in which they were marketed. These engine-vehicle combinations are then compared on the basis of estimated annual cost to the consumer above a 1970 baseline figure. Data indicate that cost alone will not govern the adoption of one emission control technology over another, either by consumers or manufacturers. Additional incentives are discussed. A.A.D.

N74-26245 Georgia Inst. of Tech., Atlanta.
NUMERICAL SOLUTION OF AXIAL-MODE INSTABILITY PROBLEMS IN SOLID PROPELLANT ROCKET MOTORS Ph.D. Thesis
Douglas Edward Kooker 1974 188 p
Avail: Univ. Microfilms Order No. 74-11417

An investigation is presented of the complex coupling between the chamber flow conditions and the solid propellant combustion process which may lead to large amplitude longitudinal instabilities. This is accomplished by obtaining numerical solutions to the time-dependent conservation equations describing the one-dimensional two-phase flow in a solid rocket combustion chamber and choked nozzle system. The solution includes the unsteady flow in the nozzle, eliminating the need for an artificial nozzle boundary condition. Permissible flow field solutions include shock wave initial disturbances as well as shock waves resulting from the interaction of continuous disturbances with the combustion process. The equations governing the time-dependent pressure-coupled combustion process are solved simultaneously with the unsteady chamber flow at a series of burning stations along the propellant grain. Dissert. Abstr.

N74-26246*# Rocketdyne, Canoga Park, Calif.
NONCIRCULAR ORIFICE HOLES AND ADVANCED FABRICATION TECHNIQUES FOR LIQUID ROCKET INJECTORS. PHASE 3: ANALYTICAL AND COLD-FLOW EXPERIMENTAL EVALUATION OF RECTANGULAR CONCENTRIC TUBE INJECTOR ELEMENTS FOR GAS/LIQUID APPLICATION. PHASE 4: ANALYTICAL AND EXPERIMENTAL EVALUATION OF NONCIRCULAR INJECTOR ELEMENTS FOR GAS/LIQUID AND LIQUID/LIQUID APPLICATION Final Report
R. M. McHale May 1974 230 p refs
(Contract NAS9-9528)
(NASA-CR-134286; R-9270) Avail: NTIS HC $14.50 CSCL 21H

Results are presented of a cold-flow and hot-fire experimental study of the mixing and atomization characteristics of injector elements incorporating noncircular orifices. Both liquid/liquid and gas/liquid element types are discussed. Unlike doublet and triplet elements (circular orifices only) were investigated for the liquid/liquid case while concentric tube elements were investigated for the gas/liquid case. It is concluded that noncircular shape can be employed to significant advantage in injector design for liquid rocket engines. Author

N74-26247*# Rocketdyne, Canoga Park, Calif.
SPACE SHUTTLE ORBIT MANEUVERING ENGINE REUSABLE THRUST CHAMBER: ADVERSE OPERATING CONDITIONS TEST REPORT
R. D. Tobin [1974] 66 p
(Contract NAS9-12802)
(NASA-CR-134282; ASR-74-131) Avail: NTIS HC $6.25 CSCL 21H

Test hardware, facilities, and procedures are described along with results of electrically heated tube and channel tests conducted to determine adverse operating condition limits for convectively cooled chambers typical of Space Shuttle Orbit Manuevering Engine designs. Hot-start tests were conducted with corrosion resistant steel and nickel tubes with both monomethylhydrazine and 50-50 coolants. Helium ingestion, in both bubble and froth form, was studied in tubular test sections. Helium bubble ingestion and burn-out limits in rectangular channels were also investigated. Author

N74-26248*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF DAMPER ON OVERALL AND BLADE-ELEMENT PERFORMANCE OF A COMPRESSOR ROTOR HAVING A TIP SPEED OF 1151 FEET PER SECOND AND AN ASPECT RATIO OF 3.6
George W. Lewis and Roy D. Hager Washington May 1974 91 p refs
(NASA-TM-X-3041; E-7068) Avail: NTIS HC $4.00 CSCL 21E

The overall and blade-element performance of two configurations of a moderately high aspect ratio transonic compressor rotor are presented. The subject rotor has conventional blade dampers. The performance is compared with a rotor utilizing dual wire friction dampers. At design speed the subject achieved a pressure ratio of 1.52 and efficiency of 0.89 at a near design weight flow of 72.1 pounds per second. The rotor with wire dampers gave consistently higher pressure ratios at each speed, but efficiencies for the two rotors were about the same. Stall margin for the subject rotor was 20.4 percent, but for the wire damped rotor only 4.0 percent. Author

N74-26249*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF A TRANSONIC COMPRESSOR ROTOR WITH AN ASPECT RATIO OF 6.5
Lonnie Reid and Edward R. Tysl Washington Jun. 1974 69 p refs
(NASA-TN-D-7662; E-7641) Avail: NTIS HC $3.75 CSCL 21E

The overall and blade-element performances and the aerodynamic design parameters of a transonic rotor with an aspect ratio of 6.5, designed to investigate the effects of aspect ratio on range and performance are presented. The rotor was designed for a total-pressure ratio of 1.53, an efficiency of 0.898, and a weight flow of 67.76 pounds per second. Author

N74-26250*# Pratt and Whitney Aircraft, East Hartford, Conn.
ADVANCED SUPERSONIC PROPULSION STUDY Final Report
J. A. Sabatella, ed. Jan. 1974 166 p
(Contract NAS3-16948)
(NASA-CR-134633; PWA-TM-4871) Avail: NTIS HC $11.50 CSCL 21E

A study was conducted to determine the promising propulsion systems for advanced supersonic transport application, and to identify the critical propulsion technology requirements. It is shown that noise constraints have a major effect on the selection of the various engine types and cycle parameters. Several promising advanced propulsion systems were identified which show the potential of achieving lower levels of sideline jet noise than the first generation supersonic transport systems. The non-afterburning turbojet engine, utilizing a very high level of jet suppression, shows the potential to achieve FAR 36 noise level. The duct-heating turbofan with a low level of jet suppression is the most attractive engine for noise levels from FAR 36 to FAR 36 minus 5 EPNdb, and some series/parallel variable cycle engines show the potential of achieving noise levels down to FAR 36 minus 10 EPNdb with moderate additional penalty. The study also shows that an advanced supersonic commercial transport would benefit appreciably from advanced propulsion technology. The critical propulsion technology needed for a viable supersonic propulsion system, and the required specific propulsion technology programs are outlined. Author

N74-26251*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

FLIGHT-MEASURED INLET PRESSURE TRANSIENTS ACCOMPANYING ENGINE COMPRESSOR SURGES ON THE F-111A AIRPLANE

Jack Nugent and Jon K. Holzman Washington Jun. 1974 30 p refs

(NASA-TN-D-7696; H-804) Avail: NTIS HC $3.25 CSCL 21E

Two-F-111A airplanes were subjected to conditions that caused engine compressor surges and accompanying duct hammershock pressure transients. Flight speed ranged from Mach 0.71 to Mach 2.23, and altitude varied from approximately 3200 meters to 14,500 meters. A wide range of compressor pressure ratios was covered. Stabilized free-stream, engine, and duct conditions were established before each compressor surge. Dynamic pressure instrumentation at the compressor face and in the duct recorded the pressure transients associated with the surges. Hammershock pressures were analyzed with respect to the stabilized conditions preceding the compressor surges. The hammershock transients caused large pressure rises at the compressor face and in the duct. Hammershock pressure ratios at the compressor face were not affected by free-stream Mach number or altitude but were functions of engine variables, such as compressor pressure ratio. The maximum hammershock pressure ratio of approximately 1.83 occurred at a compressor pressure ratio of approximately 21.7. Author

N74-26252*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TURBINE FOR A LOW COST TURBOJET ENGINE. 1: DESIGN AND COLD-AIR PERFORMANCE

Milton G. Kofskey and Richard J. Roelke Washington Jun. 1974 22 p refs Prepared in cooperation with Army Air Mobility Research and Development Lab., Cleveland

(NASA-TN-D-7625; E-7754) Avail: NTIS HC $3.00 CSCL 21E

A 24.70-cm(9.72-in.) tip diameter single-stage, axial-flow turbine was designed for a turbojet engine. Cold-air tests were made over a range of speeds from 30 to 105 percent of design equivalent speed and over a range of total-pressure ratios from 1.30 to 2.66. Results are presented in terms of specific work, torque, mass flow, and efficiency. Author

N74-26253*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATE OF TECHNOLOGY ON HYDROGEN FUELED GAS TURBINE ENGINES

Jack B. Esgar May 1974 13 p refs

(NASA-TM-X-71561; E-7990) Avail: NTIS HC $3.00 CSCL 21E

A series of investigations was conducted episodically from the 1950's to the early 1970's to investigate the feasibility and potential problem areas in the use of hydrogen fuel for gas turbine engines. A brief summary and bibliography are presented of the research that has been conducted by NASA, its predecessor NACA, and by industry under U. S. Air Force sponsorship. Although development efforts would be required to provide hydrogen fueled gas turbine engines for aircraft, past research has shown that hydrogen fueled engines are feasible, and except for flight weight liquid hydrogen pumps, there are no problem areas relating to engines requiring significant research. Author

N74-26254# Technologieforschung G.m.b.H., Stuttgart (West Germany).

DIRECT MEASUREMENT OF STEADY-STATE SPECIFIC IMPULSE OF TIROC ROCKET ENGINE UNDER VACUUM CONDITIONS Final Report

E. Schaefer Paris ESRO Dec. 1973 37 p refs

(Contract ESTEC-1394/71-HP)

(ESRO-CR-201) Avail: NTIS HC $5.00

Measurements of specific impulse in vacuum were carried out on the TIROC (tangential injection and rotational combustion) rocket engine, the world's smallest bipropellant rocket engine. It has a 1 N thrust, smallest pulse durations of some .001 sec, and long run characteristics. A thrust stand was constructed to measure thrust and propellant consumption of such small dimensions with good accuracy and reliability. It was shown that a blow-down range of nearly 3:1 is feasible with Isp decreasing proportionally to delta p from 245 sec to 160 sec. The engine is not yet fully optimized, its characteristic length (L(+)=0.186 m) being much shorter than usual. Further measurements with engines having a greater L(+) may show better Isp values. Author (ESRO)

N74-26255# Avco-Everett Research Lab., Everett, Mass.

DISK GEOMETRY MHD GENERATOR FOR HIGH VOLTAGE HIGH POWER AIRCRAFT REQUIREMENTS Final Technical Report, Jul. 1971 - Dec. 1973

James E. Klepeis and Jean F. Louis Feb. 1974 111 p refs

(Contract F33615-71-C-1905; AF Proj. 3145)

(AD-775749; AFAPL-TR-74-6) Avail: NTIS CSCL 21/3

The disk represents a magnetohydrodynamic (MHD) channel geometry in which either a simple outward radial flow occurs, or there is a combination of radial flow with swirl. Distinguishing features and major advantages of the disk are electrodeless walls, and the simplicity of channel and magnet design. For airborne applications of the MHD generator, the goal is to achieve high power density and high power per unit weight. For certain electrical loads, a high voltage output is also desirable. The disk is uniquely suited to airborne applications because the radial symmetry peculiar to the geometry, and its capability to operate at very high electric fields, makes the disk a compact, high-voltage power supply. Described in the report is an experimental program concerned with the investigation and demonstration of the high-interaction performance of a large-scale disk generator driven by a large diameter (61.0 cm) shock tube. (Modified author abstract) GRA

N74-26256# Hamilton Standard, Windsor Locks, Conn.

OVERSTRESS QUALIFICATION TEST OF THE MULTIPLE SATELLITE DISPENSER 0.2 LBF ROCKET ASSEMBLY, REA 10-16 Engineering Report

William W. Arkilander 7 Nov. 1973 197 p

(Contract N00014-73-C-0322)

(AD-775607; SVHSER-6305) Avail: NTIS CSCL 21/8

The report presents the results of a portion of a Qualification Overstress Test on Hamilton Standard Rocket Engine Assembly, Model 16-10, a nominal 0.2 pound thrust monopropellant engine. The purpose of the tests performed was to establish engine characteristics over extended life and to establish performance parameters over a range of operating conditions. GRA

N74-26257# Harry Diamond Labs., Washington, D.C.

A STUDY OF OPTIMUM ENGINE SCHEDULING AND ITS APPLICATION TO FLUIDIC FUEL INJECTION

Robert L. Woods Aug. 1973 50 p refs

(DA Proj. 1T0-61102-A-33B)

(AD-775793; HDL-TM-72-31) Avail: NTIS CSCL 21/7

The report describes a method of determining the true optimum air-fuel requirements of a spark-ignition internal-combustion engine for use in a prescheduled fluidic fuel-injection system. This air-fuel information is usually taken in an incorrect manner. The data in this report are taken correctly and result in the true optimum operating schedules. It has been determined that the true optimum air-fuel ratios are about 10% leaner than that normally thought. A discussion of this fallacy is presented. The optimum ignition timing is also investigated. A fluidic fuel-injection system utilizing this air-fuel information is proposed. In this fuel-injection concept, the operator selects fuel consumption and the fluidic control circuit schedules and controls the air consumption. The advantages of this type of system are presented. Author (GRA)

N74-26258# Naval Postgraduate School, Monterey, Calif.

CALCULATING PROCEDURE OF SEA-LEVEL STATIC PERFORMANCE OF TWO-SPOOL AFTERBURNING BYPASS JET ENGINE Progress Report

Michael H. Vavra Jun. 1973 107 p

(AD-776547; NPS-57VA73061A) Avail: NTIS CSCL 21/5

A calculating procedure is presented for the sea-level static performance of duct burning and afterburning by pass jet engines that have a low pressure and a high pressure spool. Performance values can be determined also for operation without reheat. Influence of temperature and fuel/air ratio on the thermodynamic properties of air and combustion gases is taken into account. A calculating program for a Monroe 1880-43 programmable electronic desk calculator is described which makes it possible to evaluate effects of changes of parameters on performance with minimum effort. (Modified author abstract) GRA

N74-26259# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FLAMEOUT FROM PLATE STABILIZERS
O. G. Roginskii 8 Mar. 1974 11 p refs Transl. into ENGLISH from Teoriya i Prakt. Szhiganiya Gaza (USSR), v. 5, 1972 p 72-76
(AD-776891; FTD-HT-23-873-74) Avail: NTIS CSCL 21/5

Injection burners of IGK (Kazantsev Injection Burners) with stabilizers of F. F. Kazantsev's design have found wide application. In the report the author gives results of a study of flameout characteristics of plate stabilizers. GRA

N74-26260# Hercules, Inc., Cumberland, Md. Allegany Ballistics Lab.
STUDY OF PRODUCTION METHODS FOR HIGH TEMPERATURE SOLID PROPELLANT MOTOR NOZZLES Final Report, 22 Dec. 1972 - 22 Jan. 1974
T. D. McComas, A. A. Vicario, and E. D. Casseday 1 Mar. 1974 173 p refs
(Contract DAAH01-73-C-0383)
(AD-776405; RK-CR-74-5) Avail: NTIS CSCL 21/8

The program investigated low-cost fabrication processes to permit the use of advanced materials in nozzles to achieve high performance in a severe motor environment (2000 psi - 20 sec - 100 lb/sec flow). Three materials and manufacturing processes were selected as primary candidates by an initial screening process. Detailed full-scale nozzle designs were developed for each of the candidates. Performance was evaluated in subscale motor firings. A final selection was made and is recommended for demonstration in a full size nozzle test.. The selected material is a carbon-carbon composite, manufactured from a graphite cloth layup (preform) by carbonization and successive resin infiltration/carbonization cycles for densification (= 1.45 gm/cc) and graphitization. A program plan was developed to manufacture and test the nozzle in the specified motor environment. Author (GRA)

N74-26261# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL DETERMINATION OF NATURAL FORMS OF VIBRATION IN BLADE ROWS WHEN FLUTTER IS PRESENT IN THE BLADES
I. E. Zablotskii, A. G. Zaslavskii, and R. A. Shipov 11 Mar. 1974 15 p refs Transl. into ENGLISH from Sb. Statei Lopatochnye Mashiny Struynye Apparaty (USSR), no. 6, 1972 p 122-130
(AD-776740; FTD-HT-23-674-74) Avail: NTIS CSCL 21/5

The present study describes results of simultaneous tests on vibration amplitudes and phases of blades in the presence of flutter in axial compressor rotors. GRA

N74-26262# Georgia Inst. of Tech., Atlanta.
NUMERICAL INVESTIGATION OF NONLINEAR AXIAL INSTABILITIES IN SOLID ROCKET MOTORS Contract Report, 1 Jun. 1973 - 1 Jan. 1974
D. E. Kooker and B. T. Zinn Mar. 1974 183 p refs
(Contract AF-AFOSR-2588-74; DA Proj. 1T1-61102-A-32C)
(AD-776954; BRL-CR-141) Avail: NTIS CSCL 21/8

Nonlinear axial-mode combustion instability remains a serious problem in the development of solid propellant rocket motors. Although the use of metal-loaded solid propellants which produce solid particles in the flow has reduced the occurrence of high frequency instabilities, it has not eliminated the axial-mode intermediate frequency (100 - 1000 Hz.) problem. If such an instability reaches a large amplitude limit cycle, it may lead to an increase in mean chamber pressure and burning rate, excessive heat transfer rates, and a severe vibration level. The objective of this report is to investigate the complex coupling between the chamber flow conditions and the solid propellant combustion process which may lead to large amplitude longitudinal instabilities. (Modified author abstract) GRA

N74-26263# Dayton Univ. Research Inst., Ohio. Research Inst.
COMPUTER PROGRAMS FOR SINGLE-STAGE AXIAL COMPRESSOR TEST DATA ANALYSIS. VOLUME 2: PROGRAM LISTINGS AND SAMPLE CALCULATIONS Final Report, 16 Jun. 1971 - 17 Apr. 1972
Richard M. Hearsey Dec. 1973 195 p refs
(Contract F33615-71-C-1751; AF Proj. 3066; AF Proj. 7065)
(AD-776792; UDRI-TR-72-21-Vol-2; AFAPL-TR-72-43-Vol-2)
Avail: NTIS CSCL 21/5

Contents: FORTRAN listing of program UD0100; Sample run of program UD0100; FORTRAN listing of program UD0200; Sample run of program UD0200. GRA

N74-26105* Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
THE DISPERSION OF PROPELLANTS FROM AIRCRAFT
James A. Fay and John B. Heywood *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 5-16 refs (For availability see N74-26104 15-20)
(Grant NGR-22-009-378)
CSCL 21B

N74-26106 California Univ., Berkeley. Dept. of Mechanical Engineering.
AIR POLLUTION CHARACTERISTICS OF AIRCRAFT ENGINES
Robert F. Sawyer *In* AGARD The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations Feb. 1974 p 17-26 (For availability see N74-26104 15-20)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-26264* + National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CATALOGUE OF SOLAR COSMIC RAY EVENTS: IMPS 4 AND 5, MAY 1967 - DECEMBER 1972
M. A. VanHollebeke (Maryland Univ.), J. R. Wang, and F. B. McDonald Jan. 1974 216 p
(NASA-TM-X-70629; X-661-74-27) Avail: NTIS HC $5.75 CSCL 03B

This catalogue of solar cosmic ray events has been prepared for the use of solar physicists and other interested scientists. It contains some 185 solar particle events detected by the Goddard Space Flight Center Cosmic Ray Experiments on IMP's IV and V (Explorer 34 and 41) gor the period May 1967 - December 1972. The data is presented in the form of hourly averages for three proton energy intervals - 0.9 - 1.6 MeV; 6 - 20 MeV and 20 - 80 MeV. In addition the time histories of .5 - 1.1 MeV electrons are shown on a separate scale. To assist in the identification of related solar events, the onset time of the electron event is indicated. The details of the instrumentation and detector techniques are described. Further descriptions of data reduction procedure and on the time-history plots are given. Author

N74-26265 Maryland Univ., College Park.
PROPORTIONAL COUNTER OBSERVATIONS OF DISCRETE GALACTIC X-RAY SOURCES Ph.D. Thesis
Axel Ferdinand Brisken 1973 200 p
Avail: Univ. Microfilms Order No. 74-9784

Attempts were made to observe emission from Cas A and Tycho supernova remanants using two multianode xenon filled proportional counters flown on sounding rockets. No evidence for a stable 2 to 10 keV periodic emission from Cas A or Tycho in the period range of .001 to 10.0 seconds was found. Upper limits to the pulsed fraction are presented as a function of the assumed light curve, with absolute 99% confidence upper limits of 0.089 and 0.195 for Cas A and Tycho, respectively.

Analysis of the spectral data revealed that no single component synchrotron or thermal bremsstrahlung model would adequately represent the data, nor would combinations of these, for both Cas A and Tycho. The main features of the spectra include a steep continuum and a broad emission feature at 7 keV. Synchrotron model fits to the continuum alone are rejected because the spectra would be too steep to have a break by a factor of 1/2 when compared with radio observations and because their intensity at low energies would exceed the extrapolated radio data. Dissert. Abstr.

N74-26266*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPECTRAL IRRADIANCE CURVE CALCULATIONS FOR ANY TYPE OF SOLAR ECLIPSE

Adarsh Deepak (NAS-NRC) and J. E. Merrill (Fla. Univ., Gainesville) 1 Feb. 1974 26 p refs
(NASA-TM-X-64842) Avail: NTIS HC $3.25 CSCL 03B

A simple procedure is described for calculating the eclipse function (EF), alpha, and hence the spectral irradiance curve (SIC), (1-alpha), for any type of solar eclipse: namely, the occultation (partial/total) eclipse and the transit (partial/annular) eclipse. The SIC (or the EF) gives the variation of the amount (or the loss) of solar radiation of a given wavelength reaching a distant observer for various positions of the moon across the sun. The scheme is based on the theory of light curves of eclipsing binaries, the results of which are tabulated in Merrill's Tables, and is valid for all wavelengths for which the solar limb-darkening obeys the cosine law: J = sub c (1 - X + X cost gamma). As an example of computing the SIC for an occultation eclipse which may be total, the calculations for the March 7, 1970, eclipse are described in detail. Author

N74-26267*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ORIGIN OF THE DIFFUSE BACKGROUND GAMMA-RADIATION

F. W. Stecker and J. L. Puget (Paris Obs.) May 1974 30 p refs Presented at the ESLAB Symp. on the Context and Status of Gamma-Ray Astronomy, Frascati, Italy, 10-12 Jun. 1974
(NASA-TM-X-70665; X-602-74-157) Avail: NTIS HC $4.50

Recent observations have now provided evidence for diffuse background gamma radiation extending to energies beyond 100 MeV. There is some evidence of isotropy and implied cosmological origin. Significant features in the spectrum of this background radiation have been observed which provide evidence for its origin in nuclear processes in the early stages of the big-band cosmology and tie in these processes with galaxy fromation theory. A crucial test of the theory may lie in future observations of the background radiation in the 100 MeV to 100 GeV energy range which may be made with large orbiting spark-chamber satellite detectors. A discussion of the theoretical interpretations of present data, their connection with baryon symmetric cosmology and galaxy formation theory, and the need for future observations are given. Author

N74-26268*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TWO VIEWS OF COSMIC RAY PROPAGATION IN THE SOLAR SYSTEM

E. Barouch May 1974 15 p refs
(NASA-TM-X-70664; X-693-74-155) Avail: NTIS HC $4.00 CSCL 03B

Diffusion and scatter free cosmic ray propagation theories are discussed in terms of the quality of their alternate viewpoints. A hypothetical model of conditions in interplantary space is described which aids in the comparison. A plot of the intensity of the interplanetary magnetic field over a long period is presented, and the association of these regions with high velocity streams is shown to support the scatter free viewpoint. A.A.D.

N74-26269*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ACCELERATION OF HEAVY NUCLEI IN SOLAR FLARES

Kunitomo Sakurai (Maryland Univ.) May 1974 20 p refs
(NASA-TM-X-70661; X-693-74-142) Avail: NTIS HC $4.00 CSCL 03B

The overabundance of heavy nuclei in solar cosmic rays of energy approximately < 5 Mev/nucleon is explained by taking into account the pre-flare ionization states of these nuclei in the region where they are accelerated. A model is proposed which considers two-step accelerations associated with the initial development of solar flares. The first step is closely related to the triggering process of flares, while the second one starts with the development of the explosive phase. Further ionization of medium and heavy nuclei occurs through their interaction with Kev electrons accelerated by the first-step acceleration. It is suggested that the role of these electrons is important in producing fully ionized atoms in the acceleration regions. Author

N74-26270*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PIONEER 10 OBSERVATIONS OF THE SOLAR WIND INTERATION WITH JUPITER

J. H. Wolfe, J. D. Mihalov, H. R. Collard, D. D. McKibbin, L. A. Frank (Iowa Univ.), and D. S. Intriligator (Univ. of Southern Calif., Los Angeles) May 1974 39 p refs
(NASA-TM-X-62357) Avail: NTIS HC $5.00 CSCL 03B

Pioneer 10 Plasma Analyzer experiment flight data during the Jupiter flyby are presented. The observations show that the interaction of Jupiter's magnetic field with the solar wind is similar in many ways to that at earth, but the scale size is over 100 times larger. Jupiter is found to have a detached standing bow shock wave of high Alfven Mach number. Jupiter has a prominent magnetopause which deflects the magnetosheath plasma and excludes its direct entry into the Jovian magnetosphere. The sunward hemisphere of Jupiter's outer magnetosphere is found to be highly inflated with thermal plasma and a high beta region which is highly responsive to changes in solar wind dynamic pressure. Observational arguments are presented which tend to discount a thin disklike magnetosphere but, rather, favor a Jovian magnetosphere, albeit probabily considerably flattened as compared to the earth's magnetosphere, yet still with reasonable thickness. Results concerning the shock jump conditions, the magnetosheath flow field and inferred internal magnetospheric plasma are presented. Author

N74-26271# Bureau of Mines, Morgantown, W.Va. Energy Research Center.

EVALUATING PLASTIC SCINTILLATORS FOR DETECTING PROMPT GAMMA RAYS IN CONTINUOUS ANALYSIS OF BULK MATERIALS

A. W. Hall and G. R. Friggens 1974 14 p refs
(BM-RI-7920) Avail: NTIS HC $4.00

Cylindrical plastic scintillators were investigated for efficiency in detecting neutron-induced prompt gamma rays. Scintillator performance was compared on the basis of half-resolution and peak-to-trough ratios for gamma spectra obtained from Co-60 (1.17 and 1.33 MeV), Th-228 (2.62 MeV), and PuBe (4.43 MeV). Various sizes of Pilot Chemical scintillators (types B, F, M, and Y) were tested. The best half-resolution, 7.7 percent for PuBe, was achieved with a 5- by 5-inch Pilot Y-scintillator and dual photomultipliers. Comparison with sodium iodide scintillators, and the use of plastic scintillators for on-stream analysis of sulfur in coal is discussed. Plastics were found to be unsuitable for on-stream analysis of materials having complex prompt gamma ray spectra. Author

N74-26272*# Maryland Univ., College Park. Space Physics Group.

A NEW COMPONENT OF COSMIC RAYS OF UNKNOWN ORIGIN AT A FEW MEV PER NUCLEON

George Gloecker Apr. 1974 27 p refs Presented at 1974 Spring Meeting of the Am. Phys. Soc., Washington, 22-25 Apr. 1974
(Contract NAS5-11063; Grant NGR-21-002-224)
(NASA-CR-138511; TR-74-097) Avail: NTIS HC $4.50

Recently discovered anomalies in the abundances and energy spectra of quiet time, extraterrestrial hydrogen, helium, carbon, nitrogen, and oxygen require serious revisions of origin theories to account for this new component of cosmic radiation. Abnormally large O/C and N/C ratios, long term intensity variations with time, and radial gradient measurements indicate a non-solar origin for these 2 to 30 MeV/nucleon particles. Ideas suggested to explain these measurements range from acceleration of galactic source material having an unusual composition to local acceleration of particles within the solar cavity. Observations are at present insufficient to choose between these alternate origin models. Author

N74-26273*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
MODULATION OF COSMIC-RAY PROTONS AND HELIUM NUCLEI NEAR SOLAR MAXIMUM
Thomas A. Rygg, J. J. OGallagher, and James A. Earl Apr. 1974 51 p refs
(Grant NGR-21-002-066)
(NASA-CR-138513; TR-74-039) Avail: NTIS HC $5.75 CSCL 03B

Balloon observations of proton and helium spectra in 1970, 1971 and 1972, reveal a factor of approximately 1.85 deviation from a single valued regression at low rigidities. This deviation decreases with increasing rigidity for both species. The period 1969-1970 is unique because time variations at low and high energies were anti-correlated. When satellite observations are used to extend the balloon observations to energies below 100 MeV/Nucleon, the proton spectrum showed a steeper slope in 1970 and 1972 than the characteristic J = AT spectrum observed during 1965-1969. The slope of the helium spectrum became continuously flatter during the same period (1970-1972). Computer generated spectra based on simple two parameter modulation models describe the basic features of the observations if one of the variable parameters is used to characterize the rigidity dependence of the diffusion coefficient. Models which do not allow such a variation are not consistent with the observations. Author

N74-26274*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MODEL OF THE TRAPPED ELECTRON POPULATION FOR SOLAR MINIMUM
Michael J. Teague and James I. Vette Apr. 1974 140 p refs
(NASA-TM-X-69909; NSSDC-74-03) Avail: NTIS HC $10.00 CSCL 03B

A model is presented of the trapped electron environment of solar minimum conditions. Solar maximum models have been presented for the inner radiation zone (AE-5 1967), and for the outer radiation zone (AE-4 1967). The present solar minimum model consists of an inner zone model (AE-5 1975 Projected) with an epoch of 1975, and an outer zone model with an epoch of 1964. With only minor modifications this latter model is identical to the AE-4 1964 model presented previous. The model, however, has not previously been issued in computer form. AE-4 1964 is based upon satellite data, while the inner zone solar minimum model AE-5 1975 Projected consists entirely of extrapolations from AE-5 1967. While the two components of the solar minimum model have epochs 11 years part, it is assumed that any differences between the successive solar minima are smaller than the model error, and the complete model is associated with an epoch of 1975. Author

N74-26275*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
THE EARTH AS A RADIO SOURCE: TERRESTIAL KILOMETRIC RADIATION Progress Report
Doanld A. Gurnett Feb. 1974 54 p refs
(Contracts NAS5-11074; NAS5-11431; Grant NGL-16-001-043; Contract N00014-68-A-0196-003)
(NASA-CR-138520; AD-776620; U-of-Iowa-74-11) Avail: NTIS HC $5.25 CSCL 03/2

Radio wave experiments on the IMP-6 and 8 satellites have shown that the earth emits very intense electromagnetic radiation in the frequency range from about 50 kHz to 500 kHz. A peak intensity the total power emitted in this frequency range is about 1 billion watts. The earth is, therefore, a very intense planetary radio source, with a total power output comparable to the decametric radio emission from Jupiter. This radio emission from the earth is referred to as terrestrial kilometric radiation. Terrestrial kilometric radiation appears to originate from low altitudes (less than 3.0 Re) in the auroral region. Possible mechanisms which can explain the generation and propagation of the terrestrial kilometric radiation are discussed. (Modified author abstract) GRA

N74-26276*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH-ENERGY PARTICLES ASSOCIATED WITH SOLAR FLARES
K. Sakurai and A. J. Klimas May 1974 187 p refs Submitted for publication
(NASA-TM-X-70655; X-693-74-116) Avail: NTIS HC $12.50 CSCL 03B

High-energy particles, the so-called solar cosmic rays, are often generated in association with solar flares, and then emitted into interplanetary space. These particles, consisting of electrons, protons, and other heavier nuclei, including the iron-group, are accelerated in the vicinity of the flare. By studying the temporal and spatial varation of these particles near the earth's orbit, their storage and release mechanisms in the solar corona and their propagation mechanism can be understood. The details of the nuclear composition and the rigidity spectrum for each nuclear component of the solar cosmic rays are important for investigating the acceleration mechanism in solar flares. The timing and efficiency of the acceleration process can also be investigated by using this information. These problems are described in some detail by using observational results on solar cosmic rays and associated phenomena. Author

N74-26277*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
REGOLITH HISTORY FROM COSMIC-RAY-PRODUCED ISOTOPES
E. L. Fireman Apr. 1974 16 p refs Prepared in cooperation with Harvard Coll. Obs.
(Grant NGR-09-015-145)
(NASA-CR-134261; SAO-404-069) Avail: NTIS HC $4.00 CSCL 03B

A statistical model is given for soil development relating meteoroid impacts on the moon to cosmic-ray-produced isotopes in the soil. By means of this model, the average lunar mass loss rate during the past 1.4 aeons is determined to be 170g/sq cm aeon and the soil mixing rate to be approximately 200 cm/aeon from the gadolinium isotope data for the Apollo 15 and 16 drill stems. The isotope data also restrict the time variation of the meteoroid flux during the past 1.4 aeons. Author

N74-26278# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
PLASMA CONVECTION IN POLAR IONOSPHERE
Yu. I. Galperia, V. N. Ponomarev, and A. G. Zosimova 1973 17 p refs Presented at the IAGA Conf., Kyoto, 1973
(D-161) Avail: NTIS HC $4.00

Ionospheric plasma convection velocity was measured in October-November 1967 by the Cosmos-184 satellite in a polar circular orbit at 630 km altitude from the thermal ions flow asymmetry in respect to the satellite's velocity vectors, with errors less than plus or minus 0.4 km/sec. The convection pattern above the auroral ovals is wholly consistent with results from the OGO-6 satellite. The electric field at the day polar cusp either diverges to or coverges from higher and lower latitudes but simultaneous patterns at northern and southern cusps are strikingly different. ESRO

N74-26279# Lund Univ. (Sweden). Dept. of Physics.
THE COMPOSITION OF THE COSMIC RADIATION AND THE ATOMIC PROPERTIES OF THE ELEMENTS
K. Kristiansson Feb. 1974 30 p refs Sponsored in part by Swed. Natl. Sci. Res. Council
(LUIP-CR-74-01) Avail: NTIS HC $4.00

The composition of the primordial cosmic radiation was compared with the solar system composition and that of interstellar matter. It was found that the over abundance of an element in the radiation is approximately proportional to the cross section for neutral atom ionization of that element through fast charged particle impacts. Author (ESRO)

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-26280 California Univ., Los Angeles.
ON THE MOTION OF A SATELLITE ABOUT AN OBLATE PLANET Ph.D. Thesis
Mohan Ponmalai Vijayan Ananda 1973 298 p
Avail: Univ. Microfilms Order No. 74-11490

Several aspects of the oblateness problem was studied with the use of computerized symbolic manipulation methods. The mathematical method is essentially a variation of parameters formulation with six orbit elements. Two versions were used in parallel: one with classical elements and one with equinoctial elements. In addition, for treating nonconservative perturbations, the periodic and secular perturbations of the six orbit elements in the classical atmospheric drag problem were generated.
Dissert. Abstr.

N74-26281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IRON ABUNDANCE AND MAGNETIC PERMEABILITY OF THE MOON
Curtis W. Parkin (Santa Clara Univ.), William D. Daily (Brigham Young Univ.), and Palmer Dyal Apr. 1974 41 p refs
(Grants NGR-05-017-027; NGR-45-001-040)
(NASA-TM-X-62349) Avail: NTIS HC $5.25 CSCL 03B

A set of simultaneous data from the Apollo 12 lunar surface magnetometer and the Explorer 35 Ames magnetometer are used to construct a whole-moon hysteresis curve, from which a new value of global lunar permeability is determined to be mu = 1.012 + or - 0.006. The corresponding global induced dipole moment is 2.1 x 10 to the 18th power gauss-cucm for typical inducing fields of .1000 gauss in the lunar environment. From the permeability measurement, lunar free iron abundance is determined to be 2.5 + or - 2.0 wt. %. Total iron abundance is calculated for two assumed compositional models of the lunar interior: a free iron/orthopyroxene lunar composition and a free iron/olivine composition. The overall lunar total iron abundance is determined to be 9.0 + or - 4.7 wt. %. Other lunar models with a small iron core and with a shallow iron-rich layer are discussed in light of the measured global permeability. Effects on permeability and iron content calculations due to a possible lunar ionosphere are also considered.
Author

N74-26282# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 324
14 May 1974 54 p refs Transl. into ENGLISH from various Sino-Soviet bloc publications
(JPRS-61987) Avail: NTIS HC $5.75

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics, covering both science news and formal scientific reports.
Author

N74-26283*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DERIVATION OF FORMULAS FOR ROOT-MEAN-SQUARE ERRORS IN LOCATION, ORIENTATION, AND SHAPE IN TRIANGULATION SOLUTION OF AN ELONGATED OBJECT IN SPACE
Sheila Ann T. Long Washington Jun. 1974 37 p refs
(NASA-TN-D-7477; L-9193) Avail: NTIS HC $3.25 CSCL 03B

Formulas are derived for the root-mean-square (rms) displacement, slope, and curvature errors in an azimuth-elevation image trace of an elongated object in space, as functions of the number and spacing of the input data points and the rms elevation error in the individual input data points from a single observation station. Also, formulas are derived for the total rms displacement, slope, and curvature error vectors in the triangulation solution of an elongated object in space due to the rms displacement, slope, and curvature errors, respectively, in the azimuth-elevation image traces from different observation stations. The total rms displacement, slope, and curvature error vectors provide useful measure numbers for determining the relative merits of two or more different triangulation procedures applicable to elongated objects in space.
Author

N74-26284*# Geological Survey, Boulder, Colo.
THERMOMAGNETIC ANALYSIS OF METEORITES, 2: C2 CHONDRITES
D. E. Watson, E. E. Larson, J. M. Herndon, and M. W. Rowe [1974] 19 p refs Prepared in cooperation with Colorado Univ., Boulder and Texas A/M Univ., College Station
(Grants NGR-06-003-181; NGR-44-001-152; NSF GP-18716)
(NASA-CR-138507) Avail: NTIS HC $4.00 CSCL 03B

Samples of all eighteen of the known C2 chondrites were analyzed thermomagnetically. For eleven of these, initial Fe3O4 content is low(generally <1%) and the J sub s-T curves are irreversible. The heating curves show variable and erratic behavior, whereas the cooling curves appear to be that of Fe3O4. The saturation moment after cooling is greater (up to 10 times larger) than it is initially. This behavior is interpreted to be the result of the production of magnetite from a thermally unstable phase--apparently FeS. Four of the remaining 7 C2 chondrites contain Fe3O4 as the only significant magnetic phase: initial magnetite contents range from 4 to 13 percent. The remaining three C2 chondrites contain iron or nickel-iron in addition to Fe3O4. These seven C2 chondrites show little evidence of the breakdown of a thermally unstable phase.
Author

N74-26285*# Texas A&M Univ., College Station. Dept. of Chemistry.
CONSTRAINTS OF MAGNETIC FIELD WHICH MAGNETIZED THE FARMINGTON METEORITE PARANT BODY
M. W. Rowe [1974] 13 p refs
(Grants NGR-44-001-152; NSF GP-18716)
(NASA-CR-138490) Avail: NTIS HC $4.00 CSCL 03B

Analysis indicates the following: (1) the parent body of the Farmington meteorite experienced sufficient heating (probably from shock accompanying a major collision occurring 520 million years ago) to erase the record of any magnetization acquired prior to that event; therefore, (2)the observed magnetization in the Farmington meteorite must have been acquired after the collision; and (3)shockproduced magnetization is unlikely, because of the finite cooling time indicated by the burial depth of approximately > several meters. The possibility of shock or irradiation-produced magnetizations is proposed as an experimental study, even though neither appears likely to have produced the magnetic field which produced the magnetization in the parent body of the Farmington meteorite.
Author

N74-26286*# Texas A&M Univ., College Station. Dept. of Chemistry.
DURATION OF MAGNETIC FIELD(S) ACTING ON METEORITE PARENT BODY(S)
M. W. Rowe [1974] 4 p refs
(Grants NGR-44-001-152; NSF GP-18716)
(NASA-CR-138492) Avail: NTIS HC $4.00 CSCL 03B

An overview is presented on the efforts being made to estimate the time that the magnetic field(s) existed and acted on meteorite parent bodies. The basic premise is that if a sample exhibits a low K-Ar age, it is the requisite amount of Ar-40. This assumption is applied to a preliminary analysis of the Farmington chondrite.
Author

N74-26287*# Texas A&M Univ., College Station. Dept. of Chemistry.
MAGNETISM IN METEORITES
J. M. Herndon and M. W. Rowe [1974] 27 p refs
(Grants NGR-44-001-152; NSF A-469; NSF GP-18716)
(NASA-CR-138491) Avail: NTIS HC $4.50 CSCL 03B

An overview is presented of magnetism in meteorites. A glossary of magnetism terminology followed by discussion of the various techniques used for magnetism studies in meteorites are included. The generalized results from use of these techniques by workers in the field are described. A brief critical analysis is offered.
Author

N74-26288*# Washington Univ., St. Louis, Mo. Lab. for Space Physics.

LUNAR SURFACE DYNAMICS: SOME GENERAL CONCLUSIONS AND NEW RESULTS FROM APOLLO 16 AND 17

G. Crozaz, R. Drozd, C. Hohenberg, C. Morgan, C. Ralston, R. Walker, and D. Yuhas [1974] 56 p refs
(Grant NGL-26-008-065)
(NASA-CR-138489) Avail: NTIS HC $6.00 CSCL 03B

Exposure ages of Apollo 17 rocks as measured by tracks and the Kr-Kr rare gas method are reported. Concordant ages of 22 - or + 1 million year (my) are obtained for the station 6 boulder sample 76315. This value is interpreted as the time when the station 6 boulder was emplaced in its present position. Reasonable agreement is also obtained by the two methods for another station 6 boulder, sample 76015. Discordant ages (respectively 5 and 28 my by the track and rare gas methods) are obtained for the station 7 boulder sample, 77135, indicating that the boulder was emplaced at least 5 my ago. The 72 my exposure age of 75035, in general agreement with previous measurements of approximately 85 my for another Camelot boulder, may well date the formation of Camelot. Rock 76015 was split and one surface exposed to the sky through a very small solid angle. Author

N74-26289# Lincoln Lab., Mass. Inst. of Tech., Lexington.

METHODS FOR THE RADIO-ASTRONOMICAL USE OF THE RATAN 600

Yu. N. Pariyskii Feb. 1973 67 p refs Transl. into ENGLISH from Izv. Gl. Astron. Observ. v Pulkove (Leningrad), no. 188, 1972 p 13-39
(NTC-74-11857; Rept-73-55) Avail: NTIS HC $6.50; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A consideration of the azimuthal aperture synthesis of a two dimensional radio image is made in terms of spectral analysis. Some possible variance of using the variable profile antennas (VPA), as the system of aperture synthesis, are considered. A comparison is made of the VPA with other systems of aperture synthesis. All the numerical calculations in this paper are given for the radio telescope RATAN-600; the experimental data were obtained with the Pulkovo large radio telescope. Author

N74-26290*# Oak Ridge National Lab., Tenn.

INTERACTION OF GASES WITH LUNAR MATERIALS

Progress Report, period ending 31 Jan. 1974

H. F. Holmes, E. L. Fuller, Jr., and R. B. Gammage 31 Jan. 1974 25 p refs
(NASA Order T-9380-A)
(NASA-CR-134290) Avail: NTIS HC $4.25 CSCL 03B

The surface chemistry of Apollo 17 lunar fines samples 74220 (the orange soil) and 74241 (the gray control soil) has been studied by measuring the adsorption of nitrogen, argon, and oxygen (all at 77 K) and also water vapor (at 20 or 22 C). In agreement with results for samples from other missions, both samples had low initial specific surface areas, consisted of nonporous particles, and were attacked by water vapor at high relative pressure to give an increased specific surface area and create a pore system which gave rise to a capillary condensation hysteresis loop in the adsorption isotherms. In contrast to previous samples, both of the Apollo 17 soils were partially hydrophobic in their initial interaction with water vapor (both samples were completely hydrophilic after the reaction with water). The results are consistent with formation at high temperatures without subsequent exposure to significant amounts of water. Author

N74-26291*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MODIFICATION OF AN IMPULSE-FACTORING ORBITAL TRANSFER TECHNIQUE TO ACCOUNT FOR ORBIT DETERMINATION AND MANEUVER EXECUTION ERRORS

James F. Kibler, Richard N. Green, George R. Young, and M. G. Kelly Washington Apr. 1974 41 p refs
(NASA-TM-X-2971; L-9280) Avail: NTIS HC $3.25 CSCL 22C

A method has previously been developed to satisfy terminal rendezvous and intermediate timing constraints for planetary missions involving orbital operations. The method uses impulse factoring in which a two-impulse transfer is divided into three or four impulses which add one or two intermediate orbits. The periods of the intermediate orbits and the number of revolutions in each orbit are varied to satisfy timing constraints. Techniques are developed to retarget the orbital transfer in the presence of orbit-determination and maneuver-execution errors. Sample results indicate that the nominal transfer can be retargeted with little change in either the magnitude (Delta V) or location of the individual impulses. Additonally, the total Delta V required for the retargeted transfer is little different from that required for the nominal transfer. A digital computer program developed to implement the techniques is described. Author

N74-26292*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THERMAL STRUCTURE OF THE MARTIAN ATMOSPHERE DURING THE DISSIPATION OF THE DUST STORM OF 1971

Barney J. Conrath Apr. 1974 36 p refs
(NASA-TM-X-70654; X-622-74-111) Avail: NTIS HC $5.00 CSCL 03B

The secular variation of the thermal structure of the Martian atmosphere during the dissipation phase of the 1971 dust storm is examined, using tempreatures obtained by the infrared spectroscopy investigation on Mariner 9. For the latitude range -20 to -30, the mean temperature at the 2mb level is found to decrease from approximately 220K in mid-December 1971 to about 190K by June 1972 while for the 0.3mb level a decrease from 203K to 160K is observed. Over the same period, the amplitude of the diurnal temperature wave also decreased. Assuming a simplified radiative heating model, the dust optical depth is found to decrease approximately exponentially with an e-folding time of about 60 days at both the 0.3 and 2mb levels. Stokes-Cunningham settling alone cannot account for this behavior. Sedimentation models which include both gravitational settling and vertical mixing are developed in an effort to explain the time evolution of the dust. Author

N74-26293*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN ANALYTIC METHOD TO ACCOUNT FOR DRAG IN THE VINTI SATELLITE THEORY

J. S. Watson, G. D. Mistretta, and N. L. Bonavito Apr. 1974 54 p refs Submitted for publication
(NASA-TM-X-70651; X-932-74-99) Avail: NTIS HC $5.75 CSCL 22A

To retain separability in the Vinti theory of earth satellite motion when a nonconservative force such as air drag is considered, a set of variational equations for the orbital elements are introduced, and expressed as functions of the transverse, radial, and normal components of the nonconservative forces acting on the system. In this approach, the Hamiltonian is preserved in form, and remains the total energy, but the initial or boundary conditions and hence the Jacobi constants of the motion advance with time through the variational equations. In particular, the atmospheric density profile is written as a fitted exponential function of the eccentric anomaly, which adheres to tabular data at all altitudes and simultaneously reduced the variational equations to indefinite integrals with closed form evaluations. The values of the limits for any arbitrary time interval are obtained from the Vinti program. Author.

N74-26294*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MAGNETISM AND THE INTERIOR OF THE MOON

Palmer Dyal, Curtis W. Parkin (Santa Clara Univ.), and William D. Daily (Brigham Young Univ.) 1974 52 p
(NASA-TM-X-70082) Avail: NTIS HC $5.75 CSCL 03B

During the time period 1961-1972 eleven magnetometers were sent to the moon. The results of lunar magnetometer data analysis are reviewed, with emphasis on the lunar interior. Magnetic fields have been measured on the lunar surface at the Apollo 12, 14, 15, and 16 landing sites. The remanent field values at these sites are given. Satellite and surface measurements show strong evidence that the lunar crust is magnetized over much of the lunar globe. The origin of the lunar remanent field is not yet satisfactorily understood; several source models are presented. Simultaneous data from the Apollo 12 lunar surface magnetometer and the Explorer 35 Ames magnetometer are used to construct a wholemoon hysteresis curve, from which the global lunar permeability is determined. Total iron abundance is calculated for two assumed compositional models of the lunar interior. Other lunar models with a small iron core and with a shallow iron-rich layer are also discussed in light of the measured global permeability. Author

N74-26295*# Kanner (Leo) Associates, Redwood City, Calif.
A WORKING MODEL OF THE ATMOSPHERE OF VENUS
V. I. Moroz Washington NASA Jun. 1974 25 p refs Transl. into ENGLISH of "Rabochaya Model' Atmosfery Venery", Acad. of Sci. USSR, Inst. of Space Res., Moscow, Report PR-162, 1973 27 p
(Contract NASw-2481)
(NASA-TT-F-15668; PR-162) Avail: NTIS HC $4.25 CSCL 03B

Research carried out on a working model of the atmosphere of Venus was based on observations and measurement done by Soviet and American spacecraft. The model gives the distribution of temperature, pressure, and density in the atmosphere of Venus, concluded from information available up to November 1973. Data were analyzed in pressure ranges of 0.1-1 atmosphere. Evaluations are given of solar and scattered illuminance in the upper part of the cloud layer, and also of thermal flows and wind speeds. Author

N74-26296# Texas Univ., Austin. Dept. of aerospace Engineering and Engineering Mechanics.
A COMPARISON OF ESTIMATION METHODS FOR THE REDUCTION OF LASER OBSERVATIONS OF A NEAR-EARTH SATELLITE
B. E. Schutz, J. D. McMillan, and B. D. Tapley 7 Nov. 1973 55 p refs Presented at AAS/AIAA Astrodyn. Conf., Vail, Colo., 16-18 Jul. 1973 Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Nov. 1974
(Grant AF-AFOSR-2233-72)
Avail: NTIS HC $5.75

The results are described which were obtained in a comparison of the behavior of the classical batch estimation algorithm with the extended sequential estimation algorithm, as applied to the problem of estimating the state of a near-earth satellite in the presence of geopotential modeling errors. Simulated observations as well as high accuracy laser range observations of the Beacon Explorer-C satellite, during four consecutive passes, were used in the study. The results indicate that: (1) the iterated batch algorithm converges to the same numerical estimate as the iterated extended sequential; (2) the extended sequential estimator achieves an estimate within 10 cm of the converged iterated solution on the first iteration whereas several iterations are required by the batch estimator to achieve 10 cm convergence accuracy; and (3) the radius of convergence of the extended sequential estimation algorithm appears to be about ten times as large as the radius of convergence for the batch estimator. Author

N74-26297*# California Univ., Berkeley. Dept. of Physics.
AN UPPER LIMIT ON THE EVOLUTION OF CARBON MONOXIDE FROM COMET KOHOUTEK
E. R. Wollman, T. R. Geballe, L. T. Greenberg, J. H. Lacy, C. H. Townes, and D. M. Rank 1974 6 p refs
(Grant NGR-05-003-452 ; NGR-05-003-598; NGL-05-003-272)
(NASA-CR-138501) Avail: NTIS HC $4.00 CSCL 03B

The rate of evolution of CO from Comet Kohoutex is presented. The observations were made approximately two months after perihelion. The rate of evolution of CO at that time was apparently less than that of CH3CN observed before perihelion. Author

N74-26298*# Linguistic Systems, Inc., Cambridge, Mass.
RESULTS OF RADIO EMISSION OBSERVATION FROM THE PLANET MARS ACCORDING TO DATA OF THE EXPERIMENT ON THE MARS-3 AUTOMATIC SPACE STATION
A. Ye. Basharinov, Yu. P. Vetukhnovskaya, V. P. Galakionov, I. B. Drozdovskaya, S. T. Yegorov, M. A. Kolosov, V. D. Krotikov, N. N. Krupenio, A. D. Kuzmin, V. A. Lodygin et al Washington NASA May 1974 11 p refs Transl. into ENGLISH from Kosmich. Issled. Akad. Nauk SSSR (Moscow), v. 11, no. 5, Sep. - Oct. 1973 p 803-806
(Contract NASw-2482)
(NASA-TT-F-15542) Avail: NTIS HC $4.00 CSCL 03B

The Mars-3 planetary probe was equipped with an automatically operating radiotelescope and a radiometer to measure the brightness temperature of the planet at the 3.4 cm wavelength. During the period from December 1971 to February 1972, the radiometer performed six measurement sessions. The data processing results of the values for effective surface temperature and dielectric constant of the surface material are presented in three sets of curves. They show that the dielectric constant varies from 2 to 7 with a 3.5 average value, which corresponds to 1.1 to 1.9 g/cucm density of martian rock. Temperature variations from approximately 190 K to 240 K are also observed. Author

N74-26299*# Stanford Research Inst., Menlo Park, Calif.
ASSESSMENT OF THE PROBABILITY OF CONTAMINATING MARS Final Report, 5 Jul. 1973 - 5 Feb. 1974
Bruce R. Judd, D. Warner North, and Jacques P. Pezier Apr. 1974 163 p refs
(Contract NASw-2535; SRI Proj. MSU-2788)
(NASA-CR-138522) Avail: NTIS HC $11.25 CSCL 03B

New methodology is proposed to assess the probability that the planet Mars will by biologically contaminated by terrestrial microorganisms aboard a spacecraft. Present NASA methods are based on the Sagan-Coleman formula, which states that the probability of contamination is the product of the expected microbial release and a probability of growth. The proposed new methodology extends the Sagan-Coleman approach to permit utilization of detailed information on microbial characteristics, the lethality of release and transport mechanisms, and of other information about the Martian environment. Three different types of microbial release are distinguished in the model for assessing the probability of contamination. The number of viable microbes released by each mechanism depends on the bio-burden in various locations on the spacecraft and on whether the spacecraft landing is accomploshed according to plan. For each of the three release mechanisms a probability of growth is computed, using a model for transport into an environment suited to microbial growth. Author

N74-26300*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TEMPERATURE AND ELECTRICAL CONDUCTIVITY OF THE LUNAR INTERIOR FROM MAGNETIC TRANSIENT MEASUREMENTS IN THE GEOMAGNETIC TAIL
Palmer Dyal, Curtis W. Parkin (Santa Clara Univ.), and William D. Daily (Brigham Young Univ.) [1974] 35 p refs
(NASA-TM-X-70081) Avail: NTIS HC CSCL 03B

Magnetometers were deployed at four Apollo sites on the moon to measure remanent and induced lunar magnetic fields. Measurements from this network of instruments were used to calculate the electrical conductivity, temperature, magnetic permeability, and iron abundance of the lunar interior. Global lunar fields due to eddy currents, induced in the lunar interior by magnetic transients in the geomagnetic tail field, were analyzed to calculate an electrical conductivity profile for the moon: the conductivity increases rapidly with depth from 10 to the -9 power mhos/meter at the lunar surface to .0001 mhos/meter at 200 km depth, then less rapidly to 2 x .01 mhos/meter at 1000 km depth. A temperature profile is calculated from conductivity: temperature rises rapidly with depth to 1100 K at 200 km depth, then less rapidly to 1800 K at 1000 km depth. Velocities and thicknesses of the earth's magnetopause and bow shock are estimated from simultaneous magnetometer measurements. Author

N74-26301*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LUNAR ELECTRICAL CONDUCTIVITY, PERMEABILITY, AND TEMPERATURE FROM APOLLO MAGNETOMETER EXPERIMENTS
P. Dyal, C. W. Parkin (Santa Clara Univ.), and W. D. Daily (Brigham Young Univ.) [1974] 43 p refs
(NASA-TM-X-70084) Avail: NTIS HC $5.25 CSCL 03B

The experimental results and analyses from magnetometer experiments deployed by astronauts on the surface of the moon in the Apollo program are discussed. Measurements from this network of instruments were used to calculate the magnetic permeability, electrical consuctivity, and temperature of the lunar

interior. The fossil remanent magnetic fields and the magnetic field interaction with the solar wind plasma were measured. Simultaneous magnetic field measurements by the Explorer 35 lunar orbiting satellite and the Apollo surface experiments were analyzed to determine the time dependence of eddy-current induction in the moon by solar field transients. This analysis yielded a continuous electrical conductivity profile from which an internal temperature profile is calculated for assumed lunar material compositions. Similarly, magnetic field measurements obtained when the moon is immersed in the steady geomagnetic tail are used to construct a global hysteresis curve, from which the magnetic permeability of the lunar interior is determined.
Author

N74-26302*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

IRON ABUNDANCE AND MAGNETIC PERMEABILITY OF THE MOON

Curtis W. Parkin (Santa Clara Univ.), William D. Daily (Brigham Young Univ.), and Palmer Dyal [1974] 41 p refs Prepared in cooperation with Santa Clara Univ. and Brigham Young Univ.
(Grants NGR-05-017-027; NGR-45-001-040)
(NASA-TM-X-70086) Avail: NTIS HC $5.25 CSCL 03B

A larger set of simultaneous data from the Apollo 12 lunar surface magnetometer and the Explorer 35 Ames magnetometer are used to construct a whole-moon hysteresis curve, from which a new value of global lunar permeability is determined to be mu = 1.012 + or - 0.006. The corresponding global induced dipole moment is 2.1 x 10 to the 18th power gauss-cu cm for typical inducing fields of .0001 gauss in the lunar environment. From the permeability measurement, lunar free iron abundance is determined to be 2.5 + or - 2.0 wt. %. Total iron abundance (sum of iron in the ferromagnetic and paramagnetic states) is calculated for two assumed compositional models of the lunar interior: a free iron/orthopyroxene lunar composition and a free iron/olivine composition. The overall lunar total iron abundance is determined to be 9.0 + or - 4.7 wt. %. Other lunar models with a small iron core and with a shallow iron-rich layer are discussed in light of the measured global permeability. Author

N74-26303*# Leander McCormick Observatory, Charlottesville, Va.

A CATALOGUE OF GALAXIES HAVING RADIAL VELOCITIES: VOLUME 15: PART 7

L. W. Fredrick and W. A. Gutsch 1974 19 p refs
(Grant NGL-47-005-066)
(NASA-CR-138499) Avail: NTIS HC $4.00 CSCL 03B

A tabulation of galaxies which have radial velocities is presented. The parameters of each galaxy are: (1) an abbreviation for the catalog designation, (2) RA(1950), (3) Dec. (1950), (4) new galactic longitude, (5) new galactic latitude, (6) morphological type, (7) magnitude, (8) observed radial velocity in kilometers per second (9) radial velocity corrected for solar motion, and (10) estimated error in radial velocity in kilometers per second.
Author

N74-26304*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE MOTION OF A PROTON IN THE EQUATORIAL MAGNETOSPHERE

David P. Stern May 1974 22 p refs Submitted for publication
(NASA-TM-X-70667; X-602-74-160) Avail: NTIS HC $4.25 CSCL 03B

A proton of low energy moving in the equatorial plane of the earth will experience drift motions due to both the magnetic field (magnetic gradient drift only, if the field is assumed to be that of a dipole) and the electric field. The electric drift again separates into two parts - the drift due to the main electric field (or convection electric field) existing in the frame of the earth, and that due to the earth's rotation. One result indicated by this work is that at distances of 4 - 6 earth radii, a transition from trapped proton orbits to open trajectories leading to the tail occurs at about 10 kev, the precise value depending upon local time. Such a transition also seems to be indicated by particle observations using Explorer 45. The energy spectrum (at magnetically quiet times) of equatorial protons above this energy can be explained by charge exchange but increased flux observed below it seems to be related to the influx of particles on open orbits from the tail.
Author

N74-26305*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

GEOS-C ORBIT DETERMINATION WITH SATELLITE TO SATELLITE TRACKING

P. Argentiero May 1974 21 p refs
(NASA-TM-X-70659; X-932-74-133) Avail: NTIS HC $4.25 CSCL 22C

The feasibility of employing satellite to satellite tracking in lieu of ground based tracking to satisfy the orbit determination requirements of the GEOS-C mission was studied. It is shown that with proper estimation procedures it is possible to obtain from S.S.T. data a GEOS-C orbit whose altitude error averages about 1 meter. The usefulness of this type for geopotential recovery is also indicated.
Author

N74-26306*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DESIGN OF RETRODIRECTOR ARRAYS FOR LASER RANGING OF SATELLITES

Peter O. Minott Mar. 1974 20 p Submitted for publication
(NASA-TM-X-70657; X-723-74-122) Avail: NTIS HC $4.00 CSCL 22C

The radar equation for laser ranging of satellites is described and the effect of the velocity aberration explained. Equations for the cross sections of cube corners and arrays of cube corners are derived. Interference effects on the distribution of the array cross section and upon range error are described. Tolerance requirements for cube corners are briefly outlined. Author

N74-26307*# Martin Marietta Aerospace, Denver, Colo. Planetary Systems Mission Analysis and Operations Section.

SPACE TRAJECTORY ERROR ANALYSIS PROGRAM (STEAP) FOR HALO ORBIT MISSIONS. VOLUME 1: ANALYTIC AND USER'S MANUAL Study Report, Nov. 1973 - May 1974

D. V. Byrnes, P. C. Carney, J. W. Underwood, and E. D. Vogt May 1974 211 p refs
(Contract NAS5-24067)
(NASA-CR-139020; MCR-74-98-Vol-1) Avail: NTIS HC $13.75 CSCL 22C

Development, test, conversion, and documentation of computer software for the mission analysis of missions to halo orbits about libration points in the earth-sun system is reported. The software consisting of two programs called NOMNAL and ERRAN is part of the Space Trajectories Error Analysis Programs (STEAP). The program NOMNAL targets a transfer trajectory from Earth on a given launch date to a specified halo orbit on a required arrival date. Either impulsive or finite thrust insertion maneuvers into halo orbit are permitted by the program. The transfer trajectory is consistent with a realistic launch profile input by the user. The second program ERRAN conducts error analyses of the targeted transfer trajectory. Measurements including range, doppler, star-planet angles, and apparent planet diameter are processed in a Kalman-Schmidt filter to determine the trajectory knowledge uncertainty. Execution errors at injection, midcourse correction and orbit insertion maneuvers are analyzed along with the navigation uncertainty to determine trajectory control uncertainties and fuel-sizing requirements. The program is also capable of generalized covariance analyses. Author

N74-26308*# Martin Marietta Aerospace, Denver, Colo. Planetary Systems Mission Analysis and Operations Section.

SPACE TRAJECTORY ERROR ANALYSIS PROGRAM (STEAP) FOR HALO ORBIT MISSIONS. VOLUME 2: PROGRAMMER'S MANUAL Study Report, Nov. 1973 - May 1974

D. V. Byrnes, P. C. Carney, J. W. Underwood, and E. D. Vogt May 1974 258 p refs
(Contract NAS5-24067)
(NASA-CR-139021; MCR-74-98-Vol-2) Avail: NTIS HC $16.00 CSCL 22C

The six month effort was responsible for the development, test, conversion, and documentation of computer software for the mission analysis of missions to halo orbits about libration points in the earth-sun system. The software consisting of two programs called NOMNAL and ERRAN is part of the Space Trajectories Error Analysis Programs. The program NOMNAL targets a transfer trajectory from earth on a given launch date to a specified halo orbit on a required arrival date. Either impulsive or finite thrust insertion maneuvers into halo orbit are permitted by the program. The transfer trajectory is consistent with a realistic launch profile input by the user. The second program ERRAN conducts error analyses of the targeted transfer trajectory. Measurements including range, doppler, star-planet angles, and apparent planet diameter are processed in a Kalman-Schmidt filter to determine the trajectory knowledge uncertainty. Author

N74-26309# Royal Greenwich Observatory, Herstmonceux (England). Time and Latitude Service.
GREENWICH TIME REPORT. Quarterly Report, Apr.-Jun. 1973
1973 16 p
Avail: NTIS HC $4.00

Greenwich time and latitude observations for April through June 1973 are presented. Radio time signals and standard frequency emissions are included. ESRO

N74-26310# Padua Univ. (Italy). Asiago Astrophysical Observatory.
BQ RADIO-STARS WITH INFRARED EXCESS. RESEARCH PROPOSAL ON USE OF DATA FROM THE INTERNATIONAL ULTRAVIOLET SATELLITE
F. Ciatti, A. Mammano, and S. Dodorico [1973] 6 p refs
Avail: NTIS HC $4.00

A research proposal for the use of data from the International Ultraviolet Explorer is made. The infrared objects of BQ radio stars are thought to be the most likely candidates for protoplanetaries. Interest in ultraviolet observation arose from the presence of a hot source in BQ stars, revealed by HeI and HeII emissions and/or forbidden lines. For the 10 stars to be observed in low dispersion mode, an exposure time of 0.5 hours is proposed. No particular date of observation is indicated, but the possibility of outburst cannot be excluded, which would make observation immediately thereafter extremely valuable. For low resolution spectra, a precise wavelength scale is not necessary, but photometric calibration is desirable. ESRO

N74-26311# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Jan. 1974
Massimo Cimino Jan. 1974 10 p
(Publ-189) Avail: NTIS HC $4.00

Solar data for January 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longtitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol. ESRO

N74-26312# Osservatorio Astronomico, Rome (Italy).
SOLAR PHENOMENA Monthly Bulletin, Feb. 1974
Massimo Cimino Feb. 1974 10 p
(Publ-190) Avail: NTIS HC $4.00

Solar data for February 1974 are presented. Tables include: daily total areas of sunspot groups; heliographic position, classification and area of sunspot groups; longitudinal sunspot magnetic fields, and hours of K-line cinematographic patrol. ESRO

N74-26313# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DOUBLY AVERAGED EFFECT OF THE MOON AND SUN ON A HIGH ALTITUDE EARTH SATELLITE ORBIT
Michael E. Ash 1 Mar. 1974 108 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-776022; TN-1974-5; ESD-TR-74-45) Avail: NTIS CSCL 22/3

The secular effect of the moon or sun on a high altitude earth satellite orbit is approximated by spreading the moon or sun into a circular ring of matter and averaging over one orbit of the satellite. Calculations are performed to first order in eccentricity for satellite radii inside and outside the lunar radius. The secular variations in semi-major axis and inclination to the ring plane are zero and those of the other orbital elements are given by infinite series. (Modified author abstract) GRA

N74-26314# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
THE MOTION OF AN ARTIFICIAL SATELLITE IN A NONSPHERICAL GRAVITATIONAL FIELD AND AN ATMOSPHERE WITH A QUADRATIC SCALE HEIGHT
V. L. Pisacane and R. E. Willey (Bendix Corp., Baltimore) Jan. 1974 49 p refs
(Contract N00017-72-C-4401)
(AD-776244; APL-TG-1236) Avail: NTIS CSCL 22/3

The report presents the development of a solution for satellite orbits in a nonrotating atmosphere and takes into account the second through fourth zonal harmonics of the gravitational potential. It is basically an extension of Lane's work in that his power-law representation of the atmospheric density function, which implies a linear density scale height, is replaced by a density function with a quadratic density scale height. The quadratic scale height is shown to provide a substantially better fit to the atmospheric density. To integrate the equations of motion analytically, it is necessary to expand the density function in a series. Limitations which appear in the Lane and the Brouwer and Hori theories for small eccentricities, low inclinations, and critical inclinations still exist. (Modified author abstract) GRA

N74-26315# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ERRORS IN THE EPHEMERIDES OF SATELLITES CAUSED BY NUMERICAL INTEGRATION
Ward L. Ebert Dec. 1973 65 p refs
(Contract N00017-72-C-4401)
(AD-776245; APL-TG-1233) Avail: NTIS CSCL 22/3

The theory of the Jacobi Integral is presented in the context of a coordinate frame having a varying pole and rotation rate. Plots of this quantity are shown as obtained from the numerical integration of the equations of motion of an earth satellite, and comparisons of satellite ephemerides obtained by integration at different step sizes are given. Sources of error are isolated and recommendations are made concerning use of the integration technique for ephemeris generation. Author (GRA)

N74-26316*# Naval Aerospace Medical Research Lab., Pensacola, Fla.
UNIFIED RANGE SPECTRUM AND LET DISTRIBUTION FOR HZE PARTICLES OF GALACTIC RADIATION IN SPACE
Hermann J. Schaefer 14 Dec. 1973 26 p refs
(NASA Order W-13280)
(NASA-CR-138464; AD-775614; NAMRL-1198) Avail: NTIS HC $4.50 CSCL 22/1

A unified range spectrum for the flux densities of HZE particles of galactic radiation in space is presented for establishing the individual spectrum for any Z number with a simple scaling procedure. Data on Z abundances are presented and the Z spectrum from Z = 2 to 28 is divided into four classes. Range spectra for the class representatives are derived. The influence of the geomagnetic cutoff on the range spectra for different latitudes is discussed. The data are summarized in two graphs from which event sizes in terms of LET and related track lengths and their frequencies for given target volumes can be read directly. Author (GRA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N74-26317*# Grumman Aerospace Corp., Bethpage, N.Y.
INITIAL DEVELOPMENT OF AN ABLATIVE LEADING EDGE FOR THE SPACE SHUTTLE ORBITER Final Report
G. DaForno, L. Rose, J. Graham, and P. Roy Mar. 1974 373 p refs Prepared in cooperation with AVCO Corp., Wilmington, Mass.
(Contract NAS1-11416)
(NASA-CR-132379) Avail: NTIS HC $21.75 CSCL 22B

A state-of-the-art preliminary design for typical wing areas is developed. Seven medium-density ablators (with/without honeycomb, flown on Apollo, Prime, X15A2) are evaluated. The screening tests include: (1) leading-edge models sequentially subjected to ascent heating, cold soak, entry heating, post-entry pressure fluctuations, and touchdown shock, and (2) virgin/charred models subjected to bondline strains. Two honeycomb reinforced 30 pcf elastomeric ablators were selected. Roughness/recession degradation of low speed aerodynamics appears acceptable. The design, including attachments, substructure and joints, is presented. Author

N74-26318# Joint Publications Research Service, Arlington, Va.

SALYUT SPACE STATION IN ORBIT

S. I. Bumshteyn 7 Jun. 1974 189 p Transl. into ENGLISH of the book "Salyutna Orbite" Moscow, Mashinostroyeniye, 1973 160 p
(JPRS-62201) Avail: NTIS HC $12.50

The structural features and scientific equipment of the Salyut station are described. Information and flight documents of the station, excerpts from the logs and notebooks of the cosmonauts, and fragments of their radio conversations with the flight control center are presented. The data from the scientific research and experiments performed onboard the station are generalized. Author

N74-26319*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MSFC SKYLAB ATM CALIBRATION ROCKET PROJECT Final Technical Memorandum

Washington May 1974 167 p refs
(NASA-TM-X-64846) Avail: NTIS HC $5.00 CSCL 22B

The Apollo Telescope Mount (ATM) Calibration Rocket (CALROC) performances and anomalies encountered are discussed. The performance period included six CALROC flights during the Skylab 2, 3 and 4 missions as well as those rocket flights prior to the Skylab mission which carried CALROC hardware for test purposes. Background material such as project purpose, management, launch facilities, booster and payload configuration is included for better understanding of the CALROC payload and its mission objectives. Author

N74-26320*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ORBITAL OPERATION FOR LARGE AUTOMATED SATELLITES

J. L. Lusk and V. Biro Washington May 1974 77 p
(NASA-TM-X-64847) Avail: NTIS HC $4.00 CSCL 22B

Orbital operations concepts for the shuttle launched Large Automated Satellites (LAS) are discussed. It includes the orbital operations elements and the major options for accomplishing each element. This study is based on the preliminary payload information available in Level I and II documents and on orbital operations methods used on past programs, both manned and unmanned. It includes a definition of detailed trade studies which need to be performed as satellite design details and organization responsibilities are defined. The major objectives of this study were to define operational methods and requirements for the long duration LAS missions which are effective and primarily economical to implement. Author

N74-26321*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MSFC SKYLAB AIRLOCK MODULE, VOLUME 1 Final Report

Apr. 1974 631 p refs
(NASA-TM-X-64810-Vol-1) Avail: NTIS HC $11.00 CSCL 22B

The history and development of the Skylab Airlock Module and Payload Shroud is presented from initial concept through final design. A summary is given of the Airlock features and systems. System design and performance are presented for the Spent Stage Experiment Support Module, structure and mechanical systems, mass properties, thermal and environmental control systems, EVA/IVA suite system, electrical power system, sequential system, sequential system, and instrumentation system. K.M.M.

N74-26322*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DESIGN OF A DIGITAL CONTROLLER FOR SPINNING FLEXIBLE SPACECRAFT

B. C. Kuo (Illinois Univ., Urbana), S. B Seltzer, G. Singh (Illinois Univ., Urbana), and R. A. Yackel (Illinois Univ., Urbana) Washington Apr. 1974 35 p refs Presented At the AIAA Guidance and Control Conf., Key Biscayne, Fla., 20-22 Aug. 1973
(NASA-TM-X-64851) Avail: NTIS HC $4.75 CSCL 22B

An approach to digital control system design is applied to the analysis and design of a practical onboard digital attitude control system for a class of spinning vehicles characterized by a rigid body and two connected flexible appendages. The approach used is to design a continuous-data control system that will provide a satisfactory system response. Then, using the digital redesign method, a digital controller with onboard digital computer is designed to provide a digital control system whose states are similar to those of the continuous system at sampling instants. The simplicity of application of this approach is indicated by example. The example, using spinning Skylab parameters, is used to substantiate the conclusions. Author

N74-26323*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PROJECT SHUTTLE SIMULATION MATH MODEL COORDINATION CATALOG, REVISION 1

31 May 1974 236 p refs Revised
(NASA-TM-X-70085; JSC-08965-Rev-1) Avail: NTIS HC $15.00 CSCL 22C

A catalog is presented of subsystem and environment math models used or planned for space shuttle simulations. The purpose is to facilitate sharing of similar math models between shuttle simulations. It provides information on mach model requirements, formulations, schedules, and contact persons for further information. Author

N74-26324*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SYNCHRONOUS METEOROLOGICAL SATELLITE SYSTEM DESCRIPTION DOCUMENT, VOLUME 4

J. Lahzun Feb. 1972 103 p
(NASA-TM-X-69908) Avail: NTIS HC $8.25 CSCL 22B

The command and data acquisition (CDA) station for the Synchronous Meteorological Satellite (SMS) program, located on the Eastern shore of Virginia, is described in terms of facility layout, ground support instrumentation, and capabilities. Data systems and equipment are described in detailed block diagrams. The major subsystems are identified and information on equipment specifications, frequency ranges, and data processing format is given. Automatic picture transmission, data utilization stations, data collection platforms, and the various communication links from the CDA station to the SMS spacecraft are discussed. A.A.D.

N74-26325*# Chrysler Corp., New Orleans, La. Data Management Services.

RESULTS OF TESTS OA26 AND IA16 IN THE NASA/ARC 3.5-FOOT HYPERSONIC WIND TUNNEL ON AN 0.015-SCALE MODEL (36-OTS) OF THE SPACE SHUTTLE CONFIGURATION 140A/B TO OBTAIN PRESSURES FOR VENTING ANALYSIS

R. H. Spangler (Rockwell Intern., Downey), D. E. Thornton (Rockwell Intern., Downey), and Thomas E. Polek (NASA. Ames Res. Center) Apr. 1974 203 p
(Contract NAS9-13247)
(NASA-CR-134093; DMS-DR-2124) Avail: NTIS HC $13.25 CSCL 22B

Tests were conducted, from November 15 to December 4, 1973, to obtain surface pressure data on an 0.015-scale replica of the Space Shuttle Vehicle 4. Data were obtained at Mach numbers of 5.3, 7.4, and 10.3, to support the venting analysis for both launch and entry conditions. These tests were the final tests in a series covering a Mach number range from 0.6 to 10.3. The model was instrumented with pressure orifices in the vicinity of the cargo bay door hinge and parting lines, and on the side of the fuselage at the crew compartment, and below the orbital maneuvering system pods at the aft compartment.

The model was tested at angles of attack and sideslip consistent with expected divergencies from the nominal trajectory. Author

N74-26326*# Chrysler Corp., New Orleans, La. Space Div.
RESULTS OF TESTS OA12 AND IA9 IN THE AMES RESEARCH CENTER UNITARY PLAN WIND TUNNELS ON AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 2A TO DETERMINE AERODYNAMIC LOADS, VOLUME 18
R. H. Spangler (Rockwell Intern. Corp., Downey, Calif.) Apr. 1974 1089 p refs
(Contract NAS9-13247)
(NASA-CR-128794; DMS-DR-2032-Vol-18) Avail: NTIS HC $57.50 CSCL 22B

Tests were conducted, during April and May 1973, on an 0.030-scale replica of the Space Shuttle Vehicle Configuration 2A. Aerodynamic loads data were obtained at Mach numbers from 0.6 to 3.5. The investigation included tests on the integrated (launch) configuration, and on the isolated orbiter (entry configuration). The integrated vehicle was tested at angles of attack and sideslip from -8 degrees to +8 degrees. The isolated orbiter was tested at angles of attack from -15 degrees to +40 degrees and angles of sideslip from -10 degrees to +10 degrees as dictated by trajectory considerations. The effect of orbiter/external tank incidence angle and deflected control surfaces on aerodynamic loads were also investigated. Author

N74-26327*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INVESTIGATION OF ABORT PROCEDURES FOR SPACE SHUTTLE-TYPE VEHICLES
Richard W. Powell and Donald G. Eide Jun. 1974 23 p refs
(NASA-TM-X-71952) Avail: NTIS HC $3.25 CSCL 22A

An investigation has been made of abort procedures for space shuttle-type vehicles using a point mass trajectory optimization program known as POST. This study determined the minimum time gap between immediate and once-around safe return to the launch site from a baseline due-East launch trajectory for an alternate space shuttle concept which experiences an instantaneous loss of 25 percent of the total main engine thrust. Author

N74-26328*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB MULTIPLE DOCKING ADAPTER, VOLUME 1 Final Report
Apr. 1974 461 p refs 2 Vol.
(NASA-TM-X-64812) Avail: NTIS HC $26.25 CSCL 22B

The history is presented of the development of the Skylab Multiple Docking Adapter from initial concept through its final design, related test programs, mission performance, and lessons learned. Author

N74-26329*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB MULTIPLE DOCKING ADAPTER, VOLUME 2 Final Report
Apr. 1974 326 p refs 2 Vol.
(NASA-TM-X-64812) Avail: NTIS HC $19.50 CSCL 22B

For abstract, see N74-26328.

N74-26330*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATS-F LAUNCH PLANNING DOCUMENT
Ron Walsh Apr. 1974 56 p refs
(NASA-TM-X-70653; X-460-74-104) Avail: NTIS HC $6.00 CSCL 22D

Launch operations of the ATS 6 satellite and the Titan 3 C launch vehicle are analyzed. The subjects discussed are: (1) launch vehicle trajectory, (2) launch vehicle mark events, (3) standard orbital parameter messages, (4) STADAN ground station visibility, (5) launch window, (6) separation attitude, and (7) separation events. The VHF Omni earth coverage antenna is described. Graphs of visibility from various ground stations are developed. Author

N74-26331*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF GASEOUS AND SOLID SIMULATED JET PLUMES ON AN 040A SPACE SHUTTLE LAUNCH CONFIGURATION AT $M = 1.6$ TO 2.2
Jules B. Dods, Jr., Jack J. Brownson, Donald L. Kassner, Kenneth L. Blackwell, John P. Decker, and Barney B. Roberts Washington Apr. 1974 151 p refs
(NASA-TM-X-3032; A-5212) Avail: NTIS HC $5.00 CSCL 22B

The effect of plume-induced flow separation and aspiration effects due to operation of both orbiter and the solid rocket motors on a 0.019-scale model of the launch configuration of the Space Shuttle Vehicle is determined. Longitudinal and lateral-directional stability data were obtained at Mach numbers of 1.6, 2.0, and 2.2 with and without the engines operating. The plumes exiting from the engines were simulated by a cold-gas jet supplied by an auxiliary 200-atm air supply system and solid-body plume simulators. The aerodynamic effects produced by these two simulation procedures are compared. The parameters most significantly affected by the jet plumes are pitching moment, elevon control effectiveness, axial force, and orbiter wing loads. The solid rocket motor (SRM) plumes have the largest effect on the aerodynamic characteristics. The effect of the orbiter plumes in combination with the SRM plumes is also significant. Variations in the nozzle design parameters and configuration changes can reduce the jet plume-induced aerodynamic effects. Author

N74-26332*# Kanner (Leo) Associates, Redwood City, Calif.
TEN EUROPEAN COUNTRIES BUILD THE LAUNCHER ARIANE
P. Langereux Washington NASA Jun. 1974 22 p Transl. into ENGLISH from Air Cosmos (Paris), no. 521, 16 Mar. 1974 p 29-35
(Contract NASw-2481)
(NASA-TT-F-15664) Avail: NTIS HC $4.25 CSCL 22D

Scheduled for completion in 1980, the Ariane launcher will be the first European rocket launched using a cryogenic stage powered by liquid hydrogen and oxygen. The main technical specifications for the launcher's three stages are given, with a description of its flight characteristics. Economic information on its manufacture includes a list of the contractors involved and their assigned tasks. The Ariane will enter series production in the 1980's to meet a projected European demand for 35 to 50 geostationary satellites during that decade. Author

N74-26333*# Linguistic Systems, Inc., Cambridge, Mass.
STUDY OF THE PROBLEMS OF TAKEOFF OF A SPACECRAFT FROM THE SURFACE OF MARS
V. N. Borovenko and Z. I. Rumynskaya Washington NASA Jun. 1974 15 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 11, no. 6, Nov. - Dec. 1974 p 836-841
(Contract NASw-2482)
(NASA-TT-F-15545) Avail: NTIS HC $4.00 CSCL 22A

A two-stage spacecraft is considered with a liquid-propelled rocket which takes off from the Mars surface into a predetermined Keplerian orbit. A dimensionless system of motion equations is offered, permitting, with the use of generalized dimensionless similitude coefficients, analysis of the spacecraft takeoff from planets. Problems of selecting the spacecraft takeoff trajectories for various elliptic and hyperbolic orbits are considered, and ballistic parameters of the spacecraft are determined. The optimum program of the two-stage spacecraft orbit insertion is shaped approximately. The calculated parameters are analyzed from the viewpoint of the maximum relative useful load for the piecewise-linear pitching program. Author

N74-26334*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB DATA MANAGEMENT SUBSYSTEM PHASE B STUDY
Apr. 1974 372 p refs
(NASA-TM-X-64848) Avail: NTIS HC $21.75 CSCL 22B

The Spacelab data management system is described. The data management subsystem (DMS) integrates the avionics equipment into an operational system by providing the computations, logic, signal flow, and interfaces needed to effectively command, control, monitor, and check out the experiment and subsystem hardware. Also, the DMS collects/retrieves experiment

data and other information by recording and by command of the data relay link to ground. The major elements of the DMS are the computer subsystem, data acquisition and distribution subsystem, controls and display subsystem, onboard checkout subsystem, and software. The results of the DMS portion of the Spacelab Phase B Concept Definition Study are analyzed.
Author

N74-26335*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB CONTAMINATION CONTROL SYSTEMS MISSION EVALUATION
May 1974 244 p refs
(NASA-TM-X-64826) Avail: NTIS HC $15.25 CSCL 22B

Cluster external contamination control evaluation was made throughout the Skylab Mission. This evaluation indicated that contamination control measures instigated during the design, development, and operational phases of this program were adequate to reduce the general contamination environment external to the Cluster below the threshold senstivity levels for experiments and affected subsystems. Launch and orbit contamination control features included eliminating certain vents, rerouting vents for minimum contamination impact, establishing filters, incorporating materials with minimum outgassing characteristics and developing operational constraints and mission rules to minimize contamination effects. Prior to the launch of Skylab, contamination control math models were developed which were used to predict Cluster surface deposition and background brightness levels throughout the mission. The report summarizes the Skylab system and experiment contamination control evaluation. The Cluster systems and experiments evaluated include Induced Atmosphere, Corollary and ATM Experiments, Thermal Control Surfaces, Solar Array Systems, Windows and Star Tracker.
Author

N74-26336# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DEVELOPMENT OF PHOTOGRAPHIC SATELLITE OBSERVATION UP TO THE PRESENT TIME AND FUTURE PROSPECTS
L. Strange May 1973 10 p refs Transl. into ENGLISH from Wiss. Z. Tech. Univ. Dresden (Dresden), v. 21, no. 3, 1972 p 619-622
(NTC-74-11853; Rept-74-11853) Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The development and characteristics of equipment used in photographic satellites are discussed. The parameters of two contrasting classes of satellite cameras are compared. The types of photographic plates obtained during satellite photography are examined. A numerical method for photogrammetric reduction is developed. The accuracy of the results obtained with satellite photography is reported.
Author

N74-26337*# Stanford Univ., Calif. Guidance and Control Lab.
DEVELOP MINIMUM THRUSTOR CONTROL LAWS AND SELECT ORBITS FOR A GEODESY DRAG-FREE SATELLITE Final Report
John V. Breakwell and Daniel B. DeBra Feb. 1974 25 p refs
(Contract NAS5-21714)
(NASA-CR-139018) Avail: NTIS HC $4.25 CSCL 22A

The original motivation for studying control laws for pulse plasma systems was based on the improved life characteristics possible with pulse plasma jets. These pulse plasma units are relatively massive compared with cold gas thrustors. As a result, therefore, significant mass savings can be achieved by minimizing the the number of thrustors. The control laws, therefore, were developed for thrust available from two thrustors only. In a spinning satellite, these thrustors are sufficient to completely control the vehicle as long as the spin rate is sufficiently high for a given level of external disturbance. The thrusters are canted so that a component of each is along the plus and minus spin axis. The other component of each thrustor acts in the radial direction. It is sufficient to analyze the behavior in the plane of spin assuming a single thrustor.
Author

N74-26338*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB AIRLOCK MODULE, VOLUME 2 Final Report
Apr. 1974 652 p refs
(NASA-TM-X-64810-Vol-2) Avail: NTIS HC $11.00 CSCL 22B

System design and performance of the Skylab Airlock Module and Payload Shroud are presented for the communication and caution and warning systems. Crew station and storage, crew trainers, experiments, ground support equipment, and system support activities are also reviewed. Other areas documented include the reliability and safety programs, test philosophy, engineering project management, and mission operations support.
K.M.M.

N74-26339# Endl (Kurt), Biebertal (West Germany).
OBLIQUE ALBEDO SENSORS MEASUREMENTS
Kurt Endl Jul. 1972 74 p
(Contract ESOC-367/71-AR)
Avail: NTIS HC $6.75

A mathematical theory enabling satellite spin axis determination was developed, using earth albedo sensors, also in those circumstances where the distance satellite-earth is so small that the geometric shape of the earth albedo has to be taken into account. With this theory the following cases can be distinguished: the slit of the albedo sensor triggered on the illuminated part of the earth limb; the slit triggered on the terminator between the illuminated and the dark part of the earth; and the slit triggered at an edge of the albedo shape.
ESRO

N74-26340# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
CINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 1
K. S. Russell 14 Feb. 1974 35 p ref
(ROE-STS-165) Avail: NTIS HC $4.75

Timed observations of satellites, made in azimuth and elevation with a cinetheodolite at Earlyburn Outstation, are listed in launch and time order: fully reduced observations of 29 transits of satellites 1960 epsilon 3, 1960 eta 1, 1960 eta 3 and 1960 iota 2.
Author (ESRO)

N74-26341# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
CINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 2
K. S. Russell 21 Feb. 1974 33 p ref
(ROE-STS-166) Avail: NTIS HC $4.75

Timed observations of satellites, made in azimuth and evaluation with a cinetheodolite at Earlyburn Outstation, are listed in satellite launch and time order: fully reduced observations of 27 transits of satellites 1961 omicron 1, 1961 omicron 3, 1961 sigma 1, and 1961 alpha-delta 1.
Author (ESRO)

N74-26342# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
CINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 3
K. S. Russell 22 Feb. 1974 26 p ref
(ROE-STS-167) Avail: NTIS HC $4.50

Timed observations, made in azimuth and elevation with a cinetheodolite at Earlyburn Outstation, are listed in launch order. Fully reduced observations of 17 transits of satellite 1962 Kappa 1 are included.
Author (ESRO)

N74-26343# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
CINETHEODOLITE OBSERVATIONS MADE AT EARLYBURN DURING THE OBSERVING YEAR 1964 - 1965, PART 4
K. S. Russell 28 Feb. 1974 32 p ref
(ROE-STS-168) Avail: NTIS HC $4.75

Timed observations, made in azimuth and elevation with a cinetheodolite are listed in satellite launch and time order: fully reduced observations of 27 transits of satellites 1962 omicron 1, 1962 omicron 2 and 1962 beta-alpha 1.
Author (ESRO)

N74-26344# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES. DECEM-

BER 1973
R. D. Eberst 8 Mar. 1974 40 p
(ROE-STS-169) Avail: NTIS HC $5.00

Stopwatch observations made at stations during December 1973 are listed in satellite launch and time order: 910 fully reduced observations of 160 satellites. Author (ESRO)

N74-26345# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, JANUARY 1974
R. D. Eberst 19 Mar. 1974 30 p
(ROE-STS-170) Avail: NTIS HC $4.50

Stopwatch observations made at stations during January 1974 are listed in satellite launch and time order: 549 fully reduced observations of 132 satellites. Author (ESRO)

N74-26346# Royal Aircraft Establishment, Farnborough (England).
THE MAGNETIC TORQUING SYSTEM USED ON THE ARIEL 4 SPACECRAFT
E. C. Semple and A. C. Christmas Nov. 1973 19 p refs
(RAE-TR-73142; BR37830) Avail: NTIS HC $4.00

A simple magnetic torquing system was used on the Ariel 4 spacecraft to control the pointing direction of the spin axis in space. A brief description of the onboard hardware and the post-launch operating system is given together with comments on the in-orbit performance. The proposed use of a similar system on the UK6 spacecraft is discussed. Author (ESRO)

N74-26347# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, FEBRUARY 1974
R. D. Eberst 26 Mar. 1974 29 p
(ROE-STS-171) Avail: NTIS HC $4.50

Stopwatch observations made at stations connected with the Section during Februrary 1974 are listed in launch order. 501 fully reduced observations of 127 satellites are included. Author (ESRO)

N74-26348# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
HEWITT CAMERA OBSERVATIONS MADE AT EARLYPOINT ON VARIOUS SATELLITES FROM 20 AUGUST - 31 DECEMBER 1973
K. S. Russell 3 Apr. 1974 29 p
(ROE-STS-172) Avail: NTIS HC $4.50

Satellite observations made with a Hewitt camera at Earlyburn Outstation are listed in launch order. Fully reduced observations of 35 transits of 15 satellites are included. Author (ESRO)

N74-26349# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LUNA 21: HOW THE LANDING STAGE WAS DEVELOPED BEHIND THE THRESHOLD OF THE DESIGN BUREAU
M. Borisov 25 Feb. 1974 9 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), no. 4, 18 Jan. 1973 p 4
(AD-775785; FTD-HT-23-938-74) Avail: NTIS CSCL 22/2

The various design considerations faced by Soviet engineers in developing the landing stage for Luna 21 are discussed. The requirement of placing a lunakhod on the moon along with the problem of earth-returnable equipment are also discussed. D.L.G.

N74-26350# Naval Ordnance Lab., White Oak, Md.
COMPUTER PROGRAMS FOR THE ANALYSIS OF SPACECRAFT MAGNETISM
Milton H. Lackey 28 Sep. 1973 165 p refs
(NOL Proj. 786-G01-53)
(AD-775632; NOLTR-73-191) Avail: NTIS CSCL 22/2

The report describes five computer programs that are being used at the Naval Ordnance Laboratory for analyzing satellite magnetism. The programs contain numerical analysis algorithms for the spherical harmonic analysis of the magnetic field emanating from a satellite. The analysis is directed at determining the components of the magnetism which correspond to the dipole moment, quadrupole moment, etc. The first three programs were devised to analyze data from magnetic field measurements around the satellite. The fourth program was devised to generate simulated measurement data for a specified system of multipole magnets. The last program is a combination of the data generation and the data analysis programs. Sample problems are included in the discussion to illustrate the techniques of using the programs with a CDC 6400 Computer including the INTERCOM time-sharing system. A brief description is also included of data acquisition techniques and of principal subprograms. Author (GRA)

N74-26351# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
NEW ANALYTICAL METHODS FOR SIMULATION/ESTIMATION OF ASYMMETRIC SATELLITE DYNAMICS Final Report, Sep. 1972 - Dec. 1974
John L. Junkins and Jeffery N. Blanton Dec. 1973 152 p refs
(Contract DAAK02-73-C-0041)
(AD-777015; RLES-ESS-3323-101-73; ETL-CR-73-21) Avail: NTIS CSCL 22/3

The classical solution for the torque free motion of an asymmetric rigid body is summarized. The branched nature of this solution and the singularities inherent in the classical 3-1-3 Euler angle (or any 3 parameter) representation of attitude provides the impetus to search for new universal solutions. Two new solutions which are singularity free have been derived thus avoiding difficulties encountered in the classical solution. These new solutions are based on an Euler parameter representation of attitude. This once redundant four parameter set avoids geometrical singularities implicit in all three parameter descriptions of orientation. (Modified author abstract) GRA

N74-26352# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WHAT ARE THE SOVIET SCIENTISTS WORKING ON?
26 Mar. 1974 7 p Transl. into ENGLISH from Komsomolskaya Pravda (Moscow), no. 246, 20 Oct. 1973 p 4
(AD-776921; FTD-HT-23-1200-74) Avail: NTIS CSCL 22/1

A brief review of research in Soviet space medicine is reported. GRA

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-26353 Brown Univ., Providence, R.I.
THE EFFECTS OF TEMPERATURE ON THE STATIC AND DYNAMIC STRESS-STRAIN CHARACTERISTICS IN TORSION OF 1100-0 ALUMINUM Ph.D. Thesis
Abdel Salem Mohamed Eleiche 1973 102 p
Avail: Univ. Microfilms Order No. 74-3005

A series of tests is described in which tubular specimens of a commercially pure polycrystalline aluminum were loaded in torsion at either of two dynamic rates, 300 sec/1 and 600 sec/1, up to shear strains of about 2 and 4% respectively, over the temperature range-180 C and 250C. The tests were performed in a torsional split Hopkinson bar, but the difficulties generally encountered when this apparatus is employed at an elevated or reduced temperature were avoided by tapering the Hopkinson bars appropriately so their mechanical impedance in torsion remained constant in spite of the temperature gradients along their lengths. The experimental results give the flow stress in shear, the strain and the strain rate against time. They also give stress-strain curves which are compared to the corresponding static curves obtained by testing similar specimens in torsion at about .001/sec. Dissert. Abstr.

N74-26354 Lehigh Univ., Bethlehem, Pa.
A STUDY OF MICROFRACTURE PROCESSES AT THE CRACK TIP IN STEEL AND ALUMINUM Ph.D. Thesis
Charles Kendall Clarke 1973 117 p

Avail Univ Microfilms Order No 74-11342

Compact tension fracture toughness specimens of A203D steel and 2124-T351 aluminum were studied for information on crack tip processes. A relatively large blunted crack tip was found on steel specimens broken under conditions indicative of crack tip plasticity The aluminum specimen displayed a variety of crack tip morphologies. Metallographic observations of fracture cross sections in steel showed distorted grain boundaries beneath the blunted crack tips. The blunted crack tips in the steel and aluminum specimens were equivalent to what has been previously described in the literature as stretch zones. Slipped surface region is proposed as a replacement term for stretch zone since this work demonstrated that the stretch zone is really a blunted crack tip formed by plastic flow. A qualitative theory is proposed which can explain observed fracture phenomena and can also be used as a basis for an analytical plastic model of crack tip processes.
Dissert. Abstr.

N74-26355 Tulane Univ., New Orleans, La.
THE DYNAMIC RESPONSE OF ELECTRICAL TRANSMISSION POLES TO HURRICANE WINDS Ph.D. Thesis
Newell A. Smith, Jr. 1972 205 p
Avail: Univ. Microfilms Order No. 74-10696

Research was performed to improve the procedures presently used to design electrical transmission poles against the high wind conditions associated with severe hurricanes. The principal improvements are the inclusion in the design analysis of the stochastic nature of the longitudinal component of the mechanical turbulence in the mean wind and of the dynamic response of the structure to this random excitation. The mathematical model of the turbulent wind component treats such aspects of the mechanical turbulence as the periodic nature of gusts, the effect of variations in ground roughness and the coherence or spatial extent of gusts. It also includes the variation of mean wind speed with height above ground and the effect of roughness thereon. The principal result is a computer program which provides probabilistic descriptors of the deflections, slopes, bending stresses, and shear stresses in the poles of an installation.
Dissert. Abstr.

N74-26356 Engineering Sciences Data Unit, London (England).
FATIGUE CRACK PROPAGATION IN THIN SHEET TITANIUM ALLOY
Mar. 1974 15 p refs Supersedes ESDU-Fat-A.06.05
(ESDU-74006; ESDU-Fat-A.06.05) Copyright. Avail: Issuing Activity

Curves for the rate of growth of cracks in thin titanium alloy sheet subjected to a constant amplitude tensile fatigue loading are presented. Tests were conducted on specimens with selected lengths, widths, and length/width ratios that contained a central crack in which plane stress conditions prevailed at the crack tips. All work was conducted in laboratory air, at room temperature, and at loading frequencies in the range of 0.5 Hz to 100 Hz. The crack growth rate was determined by differentiating the basic crack growth curves obtained by means of a curve fitting technique. The stress intensity factor range was calculated and the crack growth rates of the several alloys considered are plotted and compared.
A.A.D.

N74-26357 Engineering Sciences Data Unit, London (England).
UNSTABLE LENGTHS OF CENTRAL CRACKS IN UNREINFORCED SHEETS (ALUMINUM ALLOY MATERIAL - TENSILE LOADING)
May 1974 5 p refs
(ESDU-R.06.01-Amend-A) Copyright. Avail: Issuing Activity

Curves are shown which reflect the average performance during static tensile tests of unreinforced aluminum alloy sheets containing central transverse cracks. The unstable crack lengths, or the length measured immediately before fast crack growth, were plotted in relation to final failure rates of sheets in separate fatigue tests. Data is shown for the stress which, when applied to a sheet with a crack of a given length, will cause immediate failure.
A.A.D.

N74-26358+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.
A BIBLIOGRAPHY ON CREEP-FATIGUE INTERACTIONS, 1966-1973
Mar. 1974 17 p refs
(NAL-Bibl-Ser-57) Avail: NTIS HC $4.00

The bibliography includes journal articles, scientific and technical reports and books. The topic coverage includes creep under varying load, stress and temperature, fatigue-creep synergism, fatigue (thermal) at elevated temperature of refractory metals and alloys.
Author

N74-26359+ National Aeronautical Lab., Bangalore (India). Documentation Unit.
FATIGUE CRACK PROPAGATION: ALUMINUM AND TITANIUM ALLOYS STEELS, AND REINFORCED PLASTICS: AN ANNOTATED BIBLIOGRAPHY (1968 - 1972)
9 Jul. 1973 62 p refs
(NAL-Bibl-Ser-40) Avail: NTIS HC $6.25

Documents concerning the properties of fatigue crack propagation are listed. The bibliography cites 304 references.
A.A.D.

N74-26360 Ohio State Univ., Columbus.
A NUMERICAL SOLUTION FOR THE ELASTICA PROBLEM OF THE SLENDER ROD INITIALLY CURVED AND TWISTED Ph.D. Thesis
Berndt Boris Dettloff 1973 162 p
Avail: Univ. Microfilms Order No. 74-10944

A method for the numerical solution of the Clebsch-Kirchhoff equations for the elastica of the arbitrarily tortous slender rod has been presented. The differential equations have been derived in a mathematically rigorous manner. The method has been applied to write a computer program which can find the deflections for the general problem with few restrictions. The program has been used to investigate the deflection and buckling behavior of end loaded incomplete circular rings under thrust and tension. The elastic behavior of the slender rod is described by twelve simultaneous nonlinear first order differential equations. This presents a two-point boundary value problem with twelve unknown boundary conditions. Problems are restricted to an even distribution of unknown boundary conditions to the two end points and boundary conditions must be linear relationships not relating conditions at both ends.
Dissert. Abstr.

N74-26361*# Cornell Univ., Ithaca, N.Y. Dept. of Theoretical and Applied Mechanics.
ANALYSIS OF THE PARTIALLY FILLED VISCOUS RING DAMPER Final Report
Kyle T. Alfriend Oct. 1973 81 p refs
(Grant NGR-33-010-169)
(NASA-CR-138488) Avail: NTIS HC $7.25 CSCL 20K

A ring partially filled with a viscous fluid has been analyzed as a nutation damper for a spinning satellite. The fluid has been modelled as a rigid slug of finite length moving in a tube and resisted by a linear viscous force. It is shown that there are two distinct modes of motion, called the spin synchronous mode and the nutation synchronous mode. Time constants for each mode are obtained for both the symmetric and asymmetric satellite. The effects of a stop in the tube and an offset of the ring from the spin axis are also investigated. An analysis of test results is also given including a determination of the effect of gravity on the time constants in the two modes.
Author

N74-26362*# Michigan State Univ., East Lansing.
A RECIPROCAL THEOREM FOR A MIXTURE THEORY
Charles J. Martin and Yong M. Lee 1972 30 p refs
(Grant NGR-23-004-041)
(NASA-CR-138497) Avail: NTIS HC $4.50 CSCL 20K

A dynamic reciprocal theorem for a linearized theory of interacting media is developed. The constituents of the mixture are a linear elastic solid and a linearly viscous fluid. In addition to Steel's field equations, boundary conditions and inequalities on the material constants that have been shown by Atkin, Chadwick and Steel to be sufficient to guarantee uniqueness of solution to initial-boundary value problems are used. The elements of the theory are given and two different boundary value problems are considered. The reciprocal theorem is derived with the aid of the Laplace transform and the divergence theorem and this section is concluded with a discussion of the special cases which arise when one of the constituents of the mixture is absent.
Author

N74-26363*# MacNeal-Schwendler Corp., Los Angeles, Calif.
NASTRAN VARIANCE ANALYSIS AND PLOTTING OF HBDY ELEMENTS Final Report
Robert L. Harder 8 Mar. 1974 24 p refs
(Contract NAS5-24055)
(NASA-CR-139007; EC-245) Avail: NTIS HC $4.25 CSCL 20K

The NASTRAN Thermal Analyzer has been intended to do variance analysis and plot the thermal boundary elements. The objective of the variance analysis addition is to assess the sensitivity of temperature variances resulting from uncertainties inherent in input parameters for heat conduction analysis. The plotting capability provides the ability to check the geometry (location, size and orientation) of the boundary elements of a model in relation to the conduction elements. Variance analysis is the study of uncertainties of the computed results as a function of uncertainties of the input data. To study this problem using NASTRAN, a solution is made for both the expected values of all inputs, plus another solution for each uncertain variable. A variance analysis module subtracts the results to form derivatives, and then can determine the expected deviations of output quantities. Author

N74-26364*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF OUTDOOR EXPOSURE AT AMBIENT AND ELEVATED TEMPERATURES ON FATIGUE LIFE OF Ti-6Al-4V TITANIUM ALLOY SHEET IN THE ANNEALED AND THE SOLUTION TREATED AND AGED CONDITION
Edward P. Phillips Washington Jun. 1974 24 p refs
(NASA-TN-D-7540; L-9374) Avail: NTIS HC $3.00 CSCL 11F

Specimens of Ti-6Al-4V titanium alloy sheet in the annealed and the solution-treated and aged heat-treatment condition were exposed outdoors at ambient and 560 K (550 F) temperatures to determine the effect of outdoor exposure on fatigue life. Effects of exposure were determined by comparing fatigue lives of exposed specimens to those of unexpected specimens. Two procedures for fatigue testing the exposed specimens were evaluated: (1) fatigue tests conducted outdoors by applying 1200 load cycles per week until failure occurred and (2) conventional fatigue tests (continuous cycling until failure occurred) conducted indoors after outdoor exposure under static load. The exposure period ranged from 9 to 28 months for the outdoor fatigue-test group and was 24 months for the static-load group. All fatigue tests were constant-amplitude bending of specimens containing a drilled hole (stress concentration factor of 1.6). The results of the tests indicate that the fatigue lives of solution-treated and aged specimens were significantly reduced by the outdoor exposure at 560 K but not by the exposure at ambient temperature. Fatigue lives of the annealed specimens were essentially unaffected by the outdoor exposure at either temperature. The two test procedures - outdoor fatigue test and indoor fatigue test after outdoor exposure - led to the same conclusions about exposure effects. Author

N74-26365*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A RECURRENCE MATRIX METHOD FOR THE ANALYSIS OF LONGITUDINAL AND TORSIONAL VIBRATIONS IN NON-UNIFORM MULTIBRANCH BEAMS WITH VARIABLE BOUNDARY CONDITIONS
Robert B. Davis and Maria V. Stephens 6 May 1974 152 p refs
(NASA-TM-X-71973) Avail: NTIS HC $5.00 CSCL 20K

An approximate method for calculating the longitudinal and torsional natural frequencies and associated modal data of a beamlike, variable cross section multibranch structure is presented. The procedure described is the numerical integration of the first order differential equations that characterize the beam element in longitudinal motion and that satisfy the appropriate boundary conditions. Author

N74-26366*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCEDURES FOR EXPERIMENTAL MEASUREMENT AND THEORETICAL ANALYSIS OF LARGE PLASTIC DEFORMATIONS
Richard E. Morris Washington Jun. 1974 35 p refs
(NASA-TM-X-3027; E-7661) Avail: NTIS HC $3.25 CSCL 20K

Theoretical equations are derived and analytical procedures are presented for the interpretation of experimental measurements of large plastic strains in the surface of a plate. Orthogonal gage lengths established on the metal surface are measured before and after deformation. The change in orthogonality after deformation is also measured. Equations yield the principal strains, deviatoric stresses in the absence of surface friction forces, true stresses if the stress normal to the surface is known, and the orientation angle between the deformed gage line and the principal stress-strain axes. Errors in the measurement of nominal strains greater than 3 percent are within engineering accuracy. Applications suggested for this strain measurement system include the large-strain-stress analysis of impact test models, burst tests of sphericel or cylindrical pressure vessels, and to augment small-strain instrumentation tests where large strains are anticipated. Author

N74-26367*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HOLOGRAPHIC NONDESTRUCTIVE TESTS PERFORMED ON COMPOSITE SAMPLES OF CERAMIC-EPOXY-FIBERGLASS SANDWICH STRUCTURE
Robert L. Kurtz and H. K. Liu Washington Jun. 1974 33 p refs
(NASA-TR-R-430; M-461) Avail: NTIS HC $3.25 CSCL 20K

When a hologram storing more than one wave is illuminated with coherent light, the reconstructed wave fronts interfere with each other or with any other phase-related wave front derived from the illuminating source. This multiple wave front comparison is called holographic interferometry, and its application is called holographic nondestructive testing (HNDT). The theoretical aspects of HNDT techniques and the sensitivity of the holographic system to the geometrical placement of the optical components are briefly discussed. A unique HNDT system which is mobile and possesses variable sensitivity to stress amplitude is discribed, the experimental evidence of the application of this system to the testing of the hidden debonds in a ceramic-epoxy-fiberglass structure used for sample testing of the radome of the Pershing missile system is presented. Author

N74-26368*# TRW, Inc., Cleveland, Ohio.
THE PARTITIONED STRAINRANGE FATIGUE BEHAVIOR OF COATED AND UNCOATED MAR-M-302 AT 1000 C (1832 F) IN ULTRAHIGH VACUUM Final Report, 15 Jun. - 15 Oct. 1973
K. D. Sheffler Jun. 1974 48 p refs
(Contract NAS3-17786)
(NASA-CR-134626; TRW-ER-7723) Avail: NTIS HC $5.50 CSCL 20K

Elevated temperature (1000 C (1832 F)) vacuum fatigue tests were conducted on uncoated and aluminide (PWA 45) coated cobalt-base MAR-M-302 alloy with the four different types of thermal mechanical reversed inelastic strain cycles (wave shapes) defined by the method of strain range partitioning. Results of these tests indicated two major conclusions. First, there was no range significant influence of the aluminide coating on the thermal mechanical fatigue life of the MAR-M-302 alloy. Second, variations in the type of thermal mechanical fatigue cycle applied caused significant variations of fatigue life for both coated and uncoated material. Author

N74-26369# Aeronautical Research Labs., Melbourne (Australia).
SAFE FATIGUE LIVES: THE THEORY AND PRACTICE OF VARIOUS ESTIMATORS AND CONFIDENCE BOUNDS
D. G. Ford Apr. 1973 59 p refs
(ARL/SM-344) Avail: NTIS HC $6.00

Statistical and practical aspects of the theory and calculation of safe fatigue lives are discussed with particular reference to the interaction of safe life calculation to the estimation of mean fatigue lives. Kollektiv variability is included, and the RAE and variance additive models are compared for approximate and exact safe lives. For point estimates, the usual safe life, if based on a t-variate, is an exact estimator when the fatigue lives are log-normally distributed; but there is less certainty when confident safe lives are required, and without some cost analysis there is no best confidence bound to be defined. However, on the basis of maximising the chosen safe lives, the Wald-Wolfowitz tolerance bound seems to be the most useful and its calculation is relatively simple. Finally, an example is presented in which the various safe lives are calculated which shows the sequence of calculations and their relation to other parts of the fatigue problem. Author

N74-26370# Gesellschaft fuer Mathematik und Datenverabeitung, Bonn (West Germany).
EXTERNAL SPACE PROBLEMS FOR THE PLATE EQUATION WITH HILBERT SPACE METHODS [AUSSENRAUMAUFGABEN ZUR PLATTENGLEICHUNG MIT HILBERTRAUMMETHODEN]
Wolfram Wickel (Bonn Univ.) 1973 42 p refs In GERMAN Sponsored by Bundesmin. fuer Forsch. und Technol. and Landesamt fuer Forsch. des Landes Nordrehin-Westfalen
(BMFT-GMD-67) Avail: NTIS HC $5.25

Hilbert space methods were applied to an external space for the plate equation in order to treat the Dirichlet and Neumann boundary value problems. A priori estimations to prove uniqueness and existence theorems were formulated, and two lemmata are cited. Hermitian form of the first boundary value problem was formulated. A family of Neumann boundary value problems was also considered. ESRO

N74-26371# Oxford Univ. (England). Dept. of Engineering Science.
PRODUCTION PLANNING AND DESIGN IN THE PRESSURE VESSEL INDUSTRY, PART 1
M. Aswed and C. Ruiz 1974 38 p refs Sponsored in part by Natl. Oil Co. of Libya and Univ. of Tripoli
(Rept-1078/74) Avail: NTIS HC $5.00

The effect of pressure vessel design codes on the pressure vessel industry is studied, and areas in which further study would result in significant savings are identified. The design process is discussed with emphasis on the design stress and shell thickness. A general description is then given of the production process and subsequent inspection. The allocation of resources and production costs were analyzed and it was concluded that design represents a small proportion of the total effort. ESRO

N74-26372# Instituut TNO voor Werktuigkundige Constructies, Haren (Netherlands).
SHOCK LOADING TESTS OF SCALE MODELS OF POLYURETHANE DAMPERS [MODELONDERZOEK VAN POLY-URETHAAN DEMPERS ONDER SCHOKBELASTING]
J. Nauta and A. J. Francken Nov. 1973 34 p refs In DUTCH; ENGLISH summary
(IWECO-47400/4; TDCK-63426) Avail: NTIS HC $4.75

A simple model, comprising a linear viscous damper and a nonlinear spring in parallel, was tested. During the test, the damping force appeared to be proportional to the velocity, the damping constant being only slightly dependent on the shape-factor. The relation between the elastic (spring) force and the deformation could be approximated by a hyperbolic function. Young's modulus at small deformation satisfied a function of shape-factor which is in general use for rubber springs. Author (ESRO)

N74-26373# Adviesbureau der Genie, The Hague (Netherlands).
A NEW MODEL TO CALCULATE THE MOTION OF A BUNKER WHEN LOADED BY A SHOCK WAVE [EEN NIEUW MODEL OM DE BEWEGING VAN EEN BUNKER TE BEREKENEN ALS DEZE DOOR EEN SCHOKGOLF WORDT BELAST]
R. J. Boender Sep. 1973 32 p refs In DUTCH
(Rept-238-1; TDCK-63133) Avail: NTIS HC $4.75

The problem of motion of a bunker when exposed to shock loads were analyzed by means of models. Existing models were compared and accessibility was evaluated. A new model is proposed similar to the Trense model, a qualitative difference lying in the mathematical-formal character of the Trense model and the physically plausible character of the new model. ESRO

N74-26374# Nederlands Scheeps-Studiecentrum TNO, Delft.
APPLICATION OF FINITE ELEMENT METHOD FOR THE DETAILED ANALYSIS OF HATCH CORNER STRESSES
J. H. Vink Dec. 1973 43 p refs In DUTCH; ENGLISH summary
(NSR-Mededel-37-S; TDCK-64236) Avail: NTIS HC $5.25

The stress pattern for models of ship decks with large hatch openings was investigated by detailed calculations of stress near hatch corners. For one hatch corner the influence of the radius of the hatch corner upon the maximum stress was also determined. For a more conventional hatch configuration the stresses were determined for an elliptical corner and compared with circular corners. An investigation was made into the effect of hatch corner plates with increased thickness as well as the effect of a hatch coaming which may or may not be continuous at the hatch end. Author (ESRO)

N74-26375# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
STRAIN-ENERGY-DENSITY FACTOR APPLIED TO MIXED MODE CRACK PROBLEMS
G. C. Sih Jan. 1974 45 p refs
(Contract AF-AFOSR-2586-74; AF Proj. 9782)
(AD-776019; AFOSR-74-0229TR) Avail: NTIS CSCL 20/12

The paper deals with the general problem of crack extension in a combined stress field where a crack can grow in any arbitrary direction with reference to its original position. In a situation, when both of the stress-intensity factors, k1, k2 are present along the crack front, the crack may spread in any direction in a plane normal to the crack edge depending on the loading conditions. Preliminary results indicate that the direction of crack growth and fracture toughness for the mixed problem of Mode I and Mode II are governed by the critical value of the strain-energy-density factor, S(cr). The analytical predictions are in good agreement with experimental data on the problem of an inclined crack in plexiglass and aluminum alloy specimens. The result of this investigation provides a convenient procedure for determining the critical crack size that a structure will tolerate under mixed mode conditions for a given applied stress. (Modified author abstract) GRA

N74-26376# Naval Ordnance Lab., White Oak, Md.
PLANFORM INPUT GENERATOR (PING), A NASTRAN PRE-PROCESSOR FOR LIFTING SURFACES-THEORETICAL DEVELOPMENT
Pao C. Huang and John P. Matra, Jr. Dec. 1973 35 p
(AD-775633; NOLTR-73-228) Avail: NTIS CSCL 16/4

A Planform Input Generator (PING) is presented in the report. It is a pre-processor for NASTRAN analyses of lifting surfaces. Using PING, a finite element model can be automatically generated and NASTRAN bulk data cards punched, thus enabling a complicated structure to be accurately and rapidly analyzed. The report presents only the theoretical development of the pre-processor. Author (GRA)

N74-26377# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
INVESTIGATION OF PLATES AND SHELLS UNDER EXTERNAL LOADING AND ELEVATED TEMPERATURES Final Report
Joseph Kempner Feb. 1974 35 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-776047; PINY-AE/AM-74-3; AFOSR-74-0316TR) Avail: NTIS CSCL 20/11

The research briefly described in the report stems from a continuing investigation of plates and shells under external loading and elevated temperature. The principal areas covered by the studies fall into the following categories: creep of structural components; static and dynamic inelastic (plasticity) behavior; heat transfer and thermal stress; wave propagation in multilayered rods, plates and shells; and, shell theory and application. GRA

N74-26378# Physics International Co., San Leandro, Calif.
THERMAL LOADING OF STRUCTURAL MATERIALS Final Report, 26 Apr. 1972 - 24 Sep. 1973
K. Childers and J. Shea Jan. 1974 77 p refs
(Contract F29601-72-C-0085; DNA Proj. NWED-AC-304)
(AD-776068; AFWL-TR-73-164) Avail: NTIS CSCL 14/2

An experimental program to obtain dynamic strain gauge measurements and total impulse on 9-inch-diameter rings in a pulsed electron beam environment has been accomplished. A multichannel strain gauge data acquisition system was assembled and records of strains generated by thermal and combined thermal and impulsive loading were obtained for 6061-T6 aluminum and ATJ graphite rings. The mean electron energy was on the order of 600 keV and fluences on the order of 25 cal/sq. cm were obtained. Detectable permanent deformation was produced in all samples. Author (GRA)

N74-26379# California Univ., Los Angeles. School of Engineering and Applied Science.
OPTIMUM DESIGN OF RING STIFFENED CYLINDRICAL SHELLS
Allen J. Bronowicki, Richard B. Nelson, Lewis P. Felton, and Lucien A. Schmit, Jr. Feb. 1974 33 p refs
(Contract N00014-69-A-0200-4048)
(AD-776641; UCLA-ENG-7414) Avail: NTIS CSCL 20/11

The report deals with the optimum structural design of circular cylindrical shells reinforced with identical uniformly spaced T-ring stiffeners, and subjected to external pressure loading. The optimization problems considered are of three types: (1) minimum-weight design, (2) design for maximum separation of the lowest two natural frequencies, and (3) design for maximum separation of the lowest two natural frequencies which have primarily axial content. Gross buckling is precluded by specifying a minimum natural frequency, and additional behavioral constraints preclude yielding or buckling of panels, T-ring stiffeners, and web and flange instabilities within each T-ring. Analysis is based on use of an equivalent orthotropic shell model, and optimization is accomplished through use of a sequential unconstrained minimization technique. (Modified author abstract) GRA

N74-26380# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
OPTIMIZATION OF STRUCTURES FOR STRENGTH AND STABILITY REQUIREMENTS Final Report, Jun. 1972 - Apr. 1973
Narendra S. Khot, Vipperla B. Venkayya, and Laszlo Berke Dec. 1973 55 p refs
(AF Proj. 1467)
(AD-776774; AFFDL-TR-73-98) Avail: NTIS CSCL 20/11

An optimization method for minimum weight design of structures with static stability requirements is presented. The stability requirement is defined as a stiffness constraint and it is measured by the Rayleigh quotient. An optimality criterion is derived by the minimization procedure using a Lagrangian multiplier. A recursion relation for achieving the optimality ciriterion is also derived. The method is explained in the context of the displacement method of finite element analysis and the linear buckling load is determined by eigenvalue solution. The method is programmed for design of bar and beam structures. Designs are presented for columns with various end fixities, rectangular frames, and two and three dimensional bar structures. The proposed method is suitable for designing practical structures with a large number of design variables. Author (GRA)

N74-26381# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRESSED-STRAINED STATE OF CYLINDRICAL SHELL OF FIBER-GLASS-REINFORCED PLASTIC UNDER INFLUENCE OF LOCAL LOAD
Yu. P. Armyukhin, Yu. P. Zhigalko, and G. M. Salnikov 7 Mar. 1974 27 p refs Transl. into ENGLISH from Issled. Teor. Plastin Obolochek (Kazan), no. 8, 1972 p 256-271
(AD-776753; FTD-HT-23-360-74) Avail: NTIS CSCL 11/4

The article studies the stressed-strained state of an orthotropic cylindrical shell made of a material which is slightly resistant to transverse shear. Formulas describing the stressed-strained state of the shell are obtained. GRA

N74-26382# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NONAXISYMMETRIC STABILITY LOSSES IN CONICAL SHELLS UNDER THE EFFECT OF EXTERNAL PRESSURE
E. I. Grigolyuk and V. P. Maltsev 11 Mar. 1974 6 p Transl. into ENGLISH of the publ. "Nauchnaya Konferentsiya, Institut Mekhaniki MGU, Tezisy Dokladov" USSR, 1970 p 23-24
(AD-776736; FTD-HT-23-910-74) Avail: NTIS CSCL 20/11

Based on linear theory of shallow shells, two universal numerical algorithms are given in order to study the stability of conical shells under arbitrary boundary conditions and taking into consideration structural orthotropy, moments and nonlinearity in the subcritical state, and also axisymmetric initial deflections. The axisymmetric load can vary along the generatrix according to any law. The proposed method of studying stability makes it possible to determine not only the critical loads, but also the parameters of the stress-strain state with stability failure. GRA

N74-26383# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
EXPERIMENTAL DETERMINATION OF SIDE BOUNDARY EFFECTS ON STRESS INTENSITY FACTORS IN SURFACE FLAWS, 1973 - 1974
M. Jolles, J. J. McGowan, and C. W. Smith Mar. 1974 27 p refs
(Contract DAAF07-69-C-0444)
(AD-776977; VPI-E-74-5) Avail: NTIS CSCL 20/12

A technique consisting of stress-freezing photoelasticity coupled with a Taylor Series Expansion of the maximum local in-plane shearing stress known as the Taylor Series Correction Method (TSCM) is applied to the determination of stress intensity factors (SIF's) in flat bottomed surface flaws of flaw depth/length ratios of approximately 0.033. Flaw depth/thickness ratios of approximately 0.20 and 0.40 were studied as were plate width/crack length ratios of approximately 2.33 and 1.25, the former of which corresponded to a nearly infinite width. Agreement to well within 10% was found with the Rice-Levy and Newman theories using a depth-modified secant correction and equivalent flaw depth/length ratios. The Shah-Kobayashi Theory, when compared on the same basis, was lower than the experimental results. On the basis of the experiments alone, it was found that the SIF was intensified by about 10% by decreasing the plate width/crack length from 2.33 to 1.25. Author (GRA)

N74-26384# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LARGE BENDS OF ORTHOTROPIC PANELS RECTANGULAR IN PLAN-VIEW
Z. M. Pekerman and K. Z. Galimov 7 Mar. 1974 24 p refs Transl. into ENGLISH from Issled. po Teorii Plastin i Obolochek (USSR), no. 9, 1972 p 228-246
(AD-776729; FTD-HT-23-347-74) Avail: NTIS CSCL 20/11

The article considers the problem of determining large bends of a shallow orthotropic shell, rectangular in plan-view and loaded by a uniform external pressure and axial compression with different means of fastening the bearing contour. GRA

N74-26385# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LARGE BENDS IN PLATES RECTANGULAR IN PLAN-VIEW AND IN SHALLOW SHELLS MADE OF NONLINEARLY ELASTIC MATERIAL
M. S. Kornishin, N. N. Stolyarov, and N. I. Dedov 7 Mar. 1974 17 p refs Transl. into ENGLISH from Issled. po Teorii Plastin i Obolochek (USSR), no. 9, 1972 p 157-168
(AD-776754; FTD-HT-23-343-74) Avail: NTIS CSCL 20/11

For abstract, see N74-26384.

N74-26386# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY OF PLATES OF AVERAGE THICKNESS
Yu. I. Butenko and A. I. Kutikov 21 Mar. 1974 16 p refs Transl. into ENGLISH from Issled. Teor. Plastin Obolochek (Kazan), no. 9, 1972 p 419-431
(AD-776732; FTD-HT-23-354-74) Avail: NTIS CSCL 20/11

For abstract, see N74-26384.

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-26387 Minnesota Univ., Minneapolis.
TURBULENT HEAT AND MOMENTUM TRANSFER STUDIES IN AN ANNULUS WITH ROTATING INNER CYLINDER Ph.D. Thesis
Tuncer Mahmut Kuzay 1973 572 p
Avail: Univ. Microfilms Order No. 74-10623

Turbulent momentum and heat transfer are investigated in a large-gap annulus with both rotating and non rotating inner cylinder. Axial air flow is allowed to fully develop before rotation and heating are imparted. Temperature fields are investigated using probes located near the channel exit, and these fields are proved to be fully developed. Heat transfer, wall heat flux, wall axial temperature development, and radial temperature profiles are measured. Static pressure is calculated from a derived analytic expression. Law, of the wall coefficients for axial velocity are found to be correlated satisfactorily with the velocity ratio.
Dissert. Abstr.

N74-26388 Illinois Univ., Urbana.
FINITE TEMPERATURE CONTRIBUTIONS TO THE THERMODYNAMIC PROPERTIES OF A NORMAL FERMI LIQUID Ph.D. Thesis
Gilson Matheus Carneiro 1973 112 p
Avail: Univ. Microfilms Order No. 74-11970

Landau Fermi liquid theory and microscopic theory are used to investigate finite-temperature contributions to the thermodynamic properties of a normal Fermi liquid. The contribution from long wavelength spin and density fluctuations to the total energy is expressed in terms of the energy of interaction of a quasiparticle and a quasihole with small total momentum. The interaction energy is related to the scattering amplitude, which is known in terms of Landau parameters. By functional differentiation of the expression for the total energy, the quasi-particle energy and the Landau quasi-particle interactions are calculated.
Dissert. Abstr.

N74-26389*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASUREMENTS OF LINER COOLING EFFECTIVENESS WITHIN A FULL SCALE DOUBLE-ANNULAR RAM-INDUCTION COMBUSTOR
Edward J. Mularz and Donald F. Schultz Washington Jun. 1974 39 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland
(NASA-TN-D-7689; E-7831) Avail: NTIS CSCL 20M

Combustor liner temperatures were measured on a full-scale combustor to evaluate the effectiveness of various liner cooling designs. The experimental results indicate that considerable reduction of cooling airflow rate is possible by optimum utilization of available convective cooling. The liner total cooling effectiveness was not significantly dependent on inlet-air temperature and was independent of combustor temperature rise. The experimental data from various liner configurations compared quite well with the results of an analytical heat-transfer model only if a turbulent mixing coefficient C sub M of 2 to 4 percent was chosen. These values of C sub M were much lower than the measured value of combustor turbulence intensity, contrary to the model's assumption that they are numerically equal. Author

N74-26390*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF COOLING EFFECTIVENESS OF TURBINE VANES WITH AND WITHOUT FILM COOLING
Frederick C. Yeh, Herbert J. Gladden, James W. Gauntner, and Daniel J. Gauntner Washington Jun. 1974 25 p refs
(NASA-TM-X-3022; E-7860) Avail: NTIS HC $3.00 CSCL 21E

The cooling effectiveness of three film-cooled vanes were compared to the cooling effectiveness of two non-film-cooled vanes. The comparison indicated that, for the vane configurations and test conditions examined, film cooling had an adverse effect near the suction-surface trailing edge of the vanes. Film cooling was found to be beneficial on the pressure surface of the vanes. Author

N74-26391# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
THERMODYNAMICS OF THE Al-Si SYSTEM
Seth C. Schaefer 1974 18 p refs
(BM-RI-7895) Avail: NTIS HC $4.00

Thermodynamic properties of liquid Al-Si alloys with a high temperature galvanic cell are given. Activities of aluminum and silicon (referred to pure liquid-metals) show a pronounced negative deviation from Raoult's law in liquid Al-Si alloys containing 0.9 to 35.2 atomic-percent silicon. Activity coefficients and the properties Delta bar G sub i, Delta bar Gi(xs), Delta H, Delta G, Delta G(xs), and Delta S were derived from experimental data and are summarized in tables and illustrations. Author

N74-26392*# Techtran Corp., Glen Burnie, Md.
DETERMINATION OF THE BOUNDARY CONDITIONS AT THE SURFACE OF BODIES SUBJECTED TO ALTERNATING THERMAL EFFECTS
D. F. Simburskiy, A. V. Oleynik, and A. I. Skripka Washington NASA Jun. 1974 15 p refs Transl. into ENGLISH from Samoletostroyeniye i Tekhn. Vozdushnogo Flota, no. 4, 1971 p 14-22
(Contract NASw-2485)
(NASA-TT-F-15643) Avail: NTIS HC $4.00 CSCL 20M

A semiempirical method of determining the local thermal fluxes and heat transfer coefficients for turbine blades and similar elements is proposed. It is based on the use of thin film thermocouples, which do not distort the heat transfer conditions and the temperature field at the surface, and on the solution of the inverse nonstationary heat conduction problems. Author

N74-26393# Teledyne Isotopes, Timonium, Md.
AN EXPLICIT NUMERICAL METHOD FOR THE SOLUTION OF HEAT TRANSFER PROBLEMS
John A. Segletes 3 Apr. 1974 19 p refs Backup document for AIAA Synoptic, "Explicit Numerical Method for the Solution of heat Transfer Problems", scheduled for publication in AIAA Journal in Nov. 1974
(Contract AT(29-2)-2960)
(ESD-2960-146) Avail: NTIS HC $4.00

A method for the solution of heat transfer problems is presented. The method is well suited for programming on digital computers for the solution of transient or steady state thermal problems. The primary equation used in this method represents the solution of a first order linear differential equation for the temperature of cell i in a system of N cells. The stability criterion associated with this method is less restrictive than that associated with a conventional method. The basic equation used in this method is referred to as the rate-exponential equation to distinguish it from the exponential equation presented by Larkin in Ref.1. The rate-exponential and Larkin's equations are very similar. The major difference between the two is that the rate-exponential equation accounts for temperature changes of those cells exchanging heat with the cell whose temperature is being calculated, whereas Larkin's equation does not. It is shown that the terms introduced due to this refinement are necessary for the attainment of accurate solutions. Results obtained with the rate-exponential equation are compared with exact solutions and with solutions obtained by two other numerical methods, one of which utilizes Larkin's exponential equation. Author

N74-26394# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
HANDBOOK FOR THE THERMAL MODELLING OF SPACE MECHANISMS BY THE NODAL NETWORK METHOD Final Report
J. P. B. Vreeburg, A. A. M. Delil, and J. F. Heemskerk Paris ESRO Feb. 1974 195 p refs
(Contract ESTEC-1679/72)
(ESRO-CR-219) Avail: NTIS HC $12.75

A literature survey, theory, step-by-step procedure, data and examples relating to the thermal modelling of spacecraft bearing mechanisms are given. Various standard forms and formats were defined. An appropriate nodal network for the mechanism was constructed. The temperatures and heat fluxes in the nodal network were obtained with the aid of standard computer programs. The procedure is illustrated by means of sample calculations for space mechanisms that were chosen so that various classes of mechanism under various thermal loading conditions are covered. The theory underlying the thermal modelling procedure is discussed. The procedure can be adapted to heat transfer by radiation and conduction in any type of structure, because the theory is not restricted to any particular application. Tables of thermal properties of materials are included. Author (ESRO)

N74-26395# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF THE INFLUENCE OF LOW FREQUENCY PULSATIONS ON THE AERODYNAMICS OF A GAS FLAME

O. A. Kuznetsov and L. P. Yarin 22 Feb. 1974 10 p refs Transl. into ENGLISH from Teoriya i Prakt. Szhiganiya Gaza, Tr. Nauchn. Tekhn. Soveshch. (Moscow), v. 5, 1972 p 53-56
(AD-775783; FTD-HT-23-869-74) Avail: NTIS CSCL 21/2

An experimental investigation was made of the influence of low-frequency fluctuations of velocity on the aerodynamic and thermal characteristics of a turbulent homogeneous gas flame. GRA

N74-26396# Naval Ship Research and Development Center, Annapolis, Md.

THERMODYNAMIC ANALYSIS OF SPLIT-TURBINE CONCEPT

J. H. Garrett, B. R. Petry, K. T. Page, and D. Knauss Mar. 1974 62 p refs
(SF43432301)
(AD-775910; NSRDC-4181; NSRDC-27-670) Avail: NTIS CSCL 21/5

An investigation was made of the feasibility of operating a conventional gas turbine by physically separating the compressor from the expansion turbine, thus creating what has been termed the split-turbine arrangement. In this scheme, the compressor would be driven by conventional engines but located remotely from the expansion turbine. In order to analyze the split-turbine cycle the effects of varying pressure ratios, temperature ratios, and airflows were studied. An evaluation was made of the effects of duct losses in the high-pressure air duct between compressor and turbine. The effect of the separated burner in the remote turbine and the feasibility of utilizing a regenerator were determined. All of these effects were evaluated in terms of the thermal efficiency, specific fuel consumption, and net power loss attributed to the ducting. (Modified author abstract) GRA

N74-26397# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN INVESTIGATION OF THE STABILITY OF THE OPERATION OF RADIAL BURNERS WITH POROUS REFRACTORY HEADS

V. F. Zanemonets and L. V. Gololobova 8 Mar. 1974 13 p refs Transl. into ENGLISH from Teoriya i Prakt. Szhiganiya Gaza (USSR), v. 5, 1972 p 85-89
(AD-776890; FTD-HT-23-876-74) Avail: NTIS CSCL 21/2

The mechanism of flashback through a porous head was explained on the basis of the theory of thermal shock. The connection between the critical temperature of the combustion surface of the porous head and the specific gas consumption and the diameter of the grains in the head was established. The limits of the stable operating modes of burners with porous refractory heads were determined. GRA

N74-26398# Remtech, Inc., Huntsville, Ala.

PLUME INFRARED RADIATION CHARACTERISTICS Final Report

John E. Reardon, Gordon B. McKay, and Richard E. Somers 15 Mar. 1974 79 p refs
(Contract DAAH01-73-C-0252; DA Proj. 1M2-62303-A-214)
(AD-776407; RTR-013-2) Avail: NTIS CSCL 07/4

An existing computer code which uses statistical band models with 25/cm wavenumber intervals was modified. The modified program predicts radiation for H_2O, CO_2, CO, HCl, HF, and carbon particles in rocket exhaust plumes. In addition an existing program for predicting two-phase flow (uncoupled) and radiation from Al_2O_3 particles was modified for operation on a CDC 6600 computer. (Modified author abstract) GRA

N74-26399# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.

TEMPERATURE AND CONCENTRATION MEASUREMENTS ON AN AXISYMMETRIC JET AND FLAME

Samuel Lederman and J. Bornstein Dec. 1973 46 p refs Prepared in cooperation with Polytechnic Inst. of Brooklyn, Farmingdale, N. Y.
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-776614; SQUID-TR-PIB-32-PU) Avail: NTIS CSCL 07/4

The application of Raman scattering to the determination of concentration profiles of a turbulent isothermal mixing jet is discussed. Temperature measurements in a flow field using the Raman scattering techniques are investigated. Problems involved in these measurements are discussed. Experimental specie concentration data obtained on an isothermal turbulent axisymmetric mixing jet are presented. Temperature profiles of an axisymmetric methane flame, using one of the Raman techniques, are obtained and discussed. Some problems concerning LDV and high frequency turbulence measurements are indicated. Author (GRA)

N74-26400# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CERTAIN PECULIARITIES OF COMBUSTION OF BALLASTED GASES AND STABILIZATION OF A FLAME

V. A. Bolin, O. N. Ermolaev, and S. N. Shorin 8 Mar. 1974 10 p refs Transl. into ENGLISH from Teoriya i Prakt. Szhiganiya Gaza (USSR), v. 5, 1972 p 68-72
(AD-776731; FTD-HT-23-872-74) Avail: NTIS CSCL 21/2

The problems involved in burning low calorie exhaust gases (industrial by-products) are discussed. Particular attention is given to the problem of the stability of combustion of gases whose heat of combustion does not exceed 300 kcal/cu m. Flame stabilization in this process is also discussed. K.M.M.

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-26401+ National Aeronautical Lab., Bangalore (India). Information Centre for Aeronautics.

A BIBLIOGRAPHY ON CONTAMINATION CONTROL (1965-1973)

13 Mar. 1974 17 p refs
(NAL-Bibl-Ser-55) Avail: NTIS HC $4.00

Books and conference proceedings, journal articles and conference papers, scientific and technical reports and standards are reported in the bibliography. The subject coverage includes detection, analysis and measurement of contamination of hydraulic fluids. Particle counters and other related equipment are included. Author

N74-26402 Engineering Sciences Data Unit, London (England).

INDEX, 1974

1974 322 p refs
Copyright. Avail: Issuing Activity

An index with cross reference is presented which contains a wide range of engineering design and application terms extracted from the Engineering Sciences Data Series. Subseries and volume information appears with each entry which indicate available titles in the data system which are pertinent to the subject. Key terms help to pinpoint relevant material and a complete listing of all titles in the series is provided. A.A.D.

N74-26403+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands).

BIBLIOGRAPHY: OPERATIONS RESEARCH 13, O.R. 150 UP TO AND INCLUDING O.R. 162 [TITEL-INDEX OPERATIONS RESEARCH 13, O.R. 150 TOT EN MET O.R. 161]

1972 52 p refs In DUTCH; ENGLISH summary
(TDCK-60759) Avail: NTIS HC $5.75

A title bibliography is presented of 1972 literature in the field of operations research. The literature has been subdivided in theory and application. The main aspect of the application is military. ESRO

N74-26404+ Wetenschappelijk en Technisch Documentatie- en Informatiecentrum voor de Krijgsmacht, The Hague (Netherlands).
BIBLIOGRAPHY: OPERATIONS RESEARCH 14, O.R. 162 UP TO AND INCLUDING O.R 173 [TITEL-INDEX OPERATIONS RESEARCH 14, O.R. 162 TOT EN MET O.R. 173]
1973 72 p refs Partly in ENGLISH; partly in FRENCH; partly in GERMAN; and partly in DUTCH
(TDCK-62869) Avail: NTIS HC $6.75

A title bibliography is presented for 1973 literature in the field of operations research. The literature references have been subdivided as theory and applications. The main aspect of the applications section is military. ESRO

N74-26405# Committee on Aeronautical and Space Sciences (U. S. Senate).
NASA AUTHORIZATION FOR FISCAL YEAR 1975, PART 3
Washington GPO 1974 338 p Hearings on S. 2955 before Comm. on Aeron. and Space Sci., 93d Congr., 2d Sess., 2 and 4 Apr. 1974
(GPO-31-919) Avail: Comm. on Aeron. and Space Sci.

A congressional hearing to authorize appropriations for NASA programs was conducted. Comprehensive testimony was provided on the space sciences program with additional statements on Skylab solar physics, the Large Space Telescope, and Spacelab payloads. Statements on tracking and data acquisition and energy research and development were also heard. A special report by representatives of the aircraft industry cited NASA's role in aeronautical research and technology and the importance of continuing studies, particularly in noise reduction. Finally, and analysis of FY 1975 NASA budget figures is presented with attention to future programs and costs. For Pt. 1, see N74-21605; for Pt. 2, see N74-21606. A.A.D.

N74-26406# Committee on Science and Astronautics (U. S. House).
ANNUAL REPORT ON THE NATION'S PROGRESS IN AERONAUTICS AND SPACE ACTIVITIES, 1973 Message from the President of the United States, Apr. 1974
Washington GPO 1974 136 p Presented to Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., 8 Apr. 1974
(H-Doc-93-283; GPO-31-543) Avail: US Capitol, House Document Room

Activities in the space and aeronautic programs are summarized for 1973. Programs discussed include: technology application, research and development, international cooperation, air traffic control, environmental protection, and earth resources management. F.O.S.

N74-26407# Civil Aeronautics Board, Washington, D.C. Bureau of Accounts and Statistics.
AIRCRAFT OPERATING COST AND PERFORMANCE REPORT FOR CALENDER YEAR 1971 AND 1972
Jul. 1973 119 p
Avail: SOD HC $1.75

Unit cost and performance data are presented for transport aircraft operated by certificated route air carriers during the 12 months ended December 31, 1971 and the months ended December, 1972. Unit operating cost and performance data for turbine aircraft operated by the U.S. supplemental air carriers during the 12 months ended December 31, 1972 are also reported. Author

N74-26408# Committee on Government Operations (U. S. House).
TRANSPORTATION OF HAZARDOUS MATERIALS BY AIR
Washington GPO 1973 287 p Hearings before Comm. on Govt. Operations, 93d Congr., 1st Sess., 14-15 Mar. and 5 Apr. 1973
(GPO-94-779) Avail: Subcomm. on Govt. Activities

A Congressional hearing to present testimony of ongoing safety management procedures concerning hazardous air cargoes was conducted. Environment, safety, and consumer affairs were considered in statements by DOT and FAA officials. Special letters and reports submitted for the record presented details of hazardous air cargo probes, FAA training programs for air transportation of dangerous materials, and some criminal cases, specific violations, and accidents on file. Information regarding inspection activities and enforcement actions against carriers and shippers was also reported. Specific attention was paid to radioactive materials transport and a compreshensive list of all materials considered hazardous was included. Steps to further ensure the safety of passengers and crew on all flights carrying potentially dangerous cargo were recommended. A.A.D.

N74-26409# National Bureau of Standards, Washington, D.C.
THE ENERGY COMPLEX: TARGET FOR TODAY'S TECHNOLOGY
Richard W. Roberts Sep. 1973 12 p refs Presented at 3d Urban Technol. Conf., Boston, 26 Sep. 1973
Avail: NTIS HC $4.00

Per capita energy consumption, national energy expenditure, and future energy demands are cited as preface to a summary of national energy research and development efforts. National energy habits are discussed along with pertinent conservation measures. Energy source research is outlined and the building design technologies reported which make more efficient use of energy presently available. A.A.D.

N74-26410# Committee on Government Operations (U. S. House).
ECONOMY AND EFFICIENCY OF INTERNATIONAL AIR TRAVEL BY GOVERNMENT OFFICIALS
Washington GPO 1973 72 p Hearings before Comm. on Govt. Operations, 93d Congr., 1st Sess., 23 May 1973
(GPO-21-118) Avail: Subcomm. on Govt. Inform.

A Congressional hearing was conducted to hear testimony that the Government has been subjected to unjust discrimination in rates charged its nondefense passengers for international air transportation. Action to resolve the problem was reported which involves the cooperation of the U.S. air transportation industry, the various civil agencies of Government, and the CAB. The plan is described whereby chartered aircraft will be utilized in a system of reimbursement plus profit for the services provided. A.A.D.

N74-26411# Committee on Public Works (U. S. Senate).
THE ADMINISTRATION'S PROPOSAL FOR RELAXATION OF AIR POLLUTION STANDARDS
Washington GPO 1973 132 p refs Hearing before Comm. on Public Works, 93d Congr., 1st Sess., 18 Sep. 1973
(GPO-22-629) Avail: Subcomm. on Air and Water Pollution.

A Congressional hearing was conducted to assess the possible impact of relaxing air pollution standards in order to assist in reducing the severity of the energy crisis. Principal emphasis was placed on the adverse effects of permitting sulfur oxide emission standards to be lowered. A forecast of the availability of energy resources was made to show the need for importing energy supplies against the availability of energy sources from foreign countries. Various processes for reducing the sulfur content of fuels are explained. The types of alternate fuel sources which may be available are analyzed. P.N.F.

N74-26412# Committee on Public Works (U. S. Senate).
THE IMPACT OF AUTO EMISSION STANDARDS Report of the Staff of the Subcommittee on Air and Water Pollution
Washington GPO Oct. 1973 155 p refs Presented to the Comm. on Public Works, 93d Congr., 1st Sess., Oct. 1973
(GPO-21-548) Avail: Subcomm. on Air and Water Pollution

Progress is reported in a Congressional hearing on compilance with the Clean Air Act of 1970. Automobile emission control levels and test procedures are reviewed and the following issues are discussed. (1) quality assurance; (2) emission control and energy conservation; (3) the emission control technologies of catalyst systems and alternative engine designs; (4) leadtime; (5) the nitrogen oxide measurement problem; and (6) fuel additives. The role of the automotive industry in implementation of standards is exphasized. A.A.D.

N74-26413*# General Dynamics/Convair, San Diego, Calif.
AIRLINE RETURN-ON-INVESTMENT MODEL FOR TECHNOLOGY EVALUATION Final Report
May 1974 87 p
(Contract NAS1-11343)

(NASA-CR-132382) Avail: NTIS HC $7.50 CSCL 05C

This report presents the derivation, description, and operating instructions for a computer program (TEKVAL) which measures the economic value of advanced technology features applied to long range commercial passenger aircraft. The program consists of three modules; and airplane sizing routine, a direct operating cost routine, and an airline return-on-investment routine. These modules are linked such that they may be operated sequentially or individually, with one routine generating the input for the next or with the option of externally specifying the input for either of the economic routines. A very simple airplane sizing technique was previously developed, based on the Brequet range equation. For this program, that sizing technique has been greatly expanded and combined with the formerly separate DOC and ROI programs to produce TEKVAL. Author

N74-26414# Committee on Appropriations (U. S. House).
HUD-SPACE-SCIENCE-VETERANS APPROPRIATIONS FOR 1975. PART 3: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1974 1336 p Hearings before Comm. on Appropriations, 93d Congr., 2d Sess., 26-28 Mar. 1974
(GPO-33-334) Avail: Subcomm. on HUD-Space-Sci.-Veterans

The NASA budget request for fiscal year 1975 is discussed in terms of the major breakdowns for research and development, construction of facilities, and research and program management. Line items are presented in program categories and explained in terms of technology assessment and program applicability. Three additional programs are reported: Pioneer Vensus, SEASAT, and a heat capacity mapping mission. The budget provisions for these programs within the FY 1975 request explained. Program adjustments with respect to funding and inflation, particularly for space shuttle, are reported along with a five year projection of future funding implications of the FY 1975 appropriations request. A.A.D.

N74-26415# Executive Office of the President, Washington, D.C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT: 1973 ACTIVITIES
1974 136 p
Avail: SOD HC $1.70

The space and aeronautics activities during 1973 of 17 Federal departments and agencies is reported. Application of the knowledge derived from such research and development programs is emphasized. Resources and environmental monitoring and management, communications, physics and astronomy, Skylab, space shuttle, civil air transportation, and defense developments are reported under each appropriate organization. All specific programs in space and aeronautics operative during the year are summarized. A.A.D.

N74-26416# National Science Foundation, Washington, D.C.
NATIONAL PATTERNS OF R AND D RESOURCES: 2 FUNDS AND MANPOWER IN THE UNITED STATES, 1953 - 1974
Feb. 1974 35 p refs
(NSF-74-304) Avail: SOD HC $1.00

The data contained in this report are based primarily on a series of periodic National Science Foundation surveys on research and development resources in the United States. This study shows the pattern of allocation of R and D funds and manpower among the four sectors of the economy - Federal Government, industry, universities and colleges, and other nonprofit institutions. The R and D funds series presented provide the data not only for total research and development but also for basic research, applied research, and development, and cover the period from 1953-74. Time series data on R and D scientific and engineering manpower employed by each sector begin with 1954. Author

N74-26417# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
THE STANDARDS OF TIME AND FREQUENCY IN THE USA
James A. Barnes and G. M. R. Winkler (Naval Obs.) Feb. 1974 91 p refs
(NBS Proj. 2730900)
(NBS-TN-649) Avail: SOD HC $1.00 as C13.40:649

The national responsibilities for standards of time and frequency in the U.S.A. are described. The National Bureau of Standards (NBS) and the U. S. Naval Observatory (USNO) are the two organizations chiefly involved in distributing accurate and precise time and frequency information within the U.S.A. The NBS is responsible for the custody, maintenance, and development of the national standards of frequency and time (interval) as well as their dissemination to the general public. The mission of the USNO includes the provision of accurate time for electronic navigation systems, communication, and space technology. This is an integral part of its work concerned with the publication of ephemerides which are used in support of navigation and in the establishment of a fundamental reference system in space. Both agencies provide the U. S. contribution to the Bureau International de l'Heure (BIH) (International Time Bureau), which has the responsibility of publishing definitive values of Universal Time (UT)m International Atomic Time (TAI), and Coordinated Universal Time (UTC). Author

N74-26418# National Science Foundation, Washington, D.C.
FEDERAL FUNDS FOR RESEARCH, DEVELOPMENT, AND OTHER SCIENTIFIC ACTIVITIES, VOLUME 22. FISCAL YEARS 1972, 1973 AND 1974
Dec. 1973 68 p refs
(NSF-74-300-Vol-22) Avail: SOD HC $1.45

This report is based on information furnished by Federal agencies supporting research and development, R and D plant, and scientific information activities. The R and D data, which form the main body of the report, are shown by character of work, type of performer, field of science, and geographic (State) distribution. They provide a base upon which more detailed studies can be made of the economic and social impact of Federal R and D investments. Author

N74-26419# Oesterreichische Akademie der Wissenschaften, Vienna.
SPACE RESEARCH ACTIVITIES IN AUSTRIA, 1972-1973
Ferdinand Steinhauser 1973 11 p
Avail: NTIS HC $4.00

Austrian activity in space research in 1972 and 1973 is described. Sounding rocket and balloon programs are summarized and ongoing particle experiments and wave propagation work outlined. Papers published during the period are listed. ESRO

N74-26420# Naval Postgraduate School, Monterey, Calif.
NEEDS AND CHALLENGES IN EDUCATION FOR AIRCRAFT DESIGN
Ulrich Haupt Nov. 1973 150 p refs
(AD-775938; NPS-57HP73121A) Avail: NTIS CSCL 05/9

A brief review of recent developments in engineering education leads to basic reflections about the importance of design education. Aircraft design is singled out as a field where demands on design are particularly high and urgent. Basic needs are determined. Additional challenges posed by engineering technology, continuing studies, liberal-technical education, and new concepts of professionalism are discussed. An overall perspective is developed which foresees a dynamic evolutionary process and indicates that much initiative should originate on the faculty level while guidance should be provided on a policy-making level. Author (GRA)

N74-26421# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ORGANIZATION AND PLANNING OF PRODUCTION AT AIRCRAFT ENGINE-BUILDING PLANTS
V. I. Tikhomirov and F. I. Paramonov 14 Jan. 1974 642 p refs Transl. into ENGLISH of the book "Organizatsiya i Planirovanie Proizvodstva na Aviadvigatele-Stroitelnykh Zavodakh" Moscow, Machine Building Publishing, House, 1972 p 1-448
(FTD Proj. T74-01-67)
(AD-775780; FTD-MT-24-499-73) Avail: NTIS CSCL 21/5

The research was to identifiy and evaluate the importance of selected factors of the employees and their environment which might motivate them to work nonday shift schedules in Air Material Area (AMA) Aircraft Maintenance functions of the Air Force Logistics Command. Four general factor areas were considered: selected individual characteristics, hygiene, motivational and off-the-job aspects. A mailed questionnaire was developed to measure the perceived importance of selected factors with respect to shift preference. Data was gathered from a sample of 204 employees randomly selected from the Aircraft Divisions of the five AMA:s. The results of the research indicated three sub-factors that were significantly different across shift preference groups. These subfactors were age, grade classification and salary. The other 13 subfactors were not supported as being different across shift preference groups. The implications of these results reinforce the intuitive conclusion that shift preference is largely tempered by differential pay considerations. Author (GRA)

N74-26422# Army Natick Labs., Mass.
MILITARY POTENTIAL TEST OF INTERIM HIGH LEVEL CONTAINERS AIRDROP SYSTEM (HLCADS) Final Report
Edward J. Barnicle Nov. 1973 53 p refs
(DA Proj. 1F2-64204-DC-33)
(AD-776898; USA-NLABS-TR-74-23-AD) Avail: NTIS CSCL 15/7

The U. S. Army Natick Laboratories and the U. S. Army Airborne, Communications and Electronics Board, Fort Bragg, N. C., conducted an airdrop test on the Interim High Level Container Airdrop System for the purpose of determining the suitability of using a Confine Ballistic Cutter in a Two Stage Configuration. Author (GRA)

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